GONORRHEA

ITS DIAGNOSIS AND TREATMENT

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BY

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PREFACE.

In the preparation of this work, the author has attempted to fulfill an oft-repeated wish of the students attending his clinic at the Medical Department of the University of Illinois to furnish them with a concise digest of the diagnosis and treatment of the gonorrheal infections of the lower genitourinary tract. The writings of Oberlaender and Kollmann have been consulted extensively and every effort has been made to adhere to their teachings as closely as possible.

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CHAPTER I.

ANATOMY OF THE URETHRA.

In the male, the edges of the ectodermal portion of the urogenital sinus unite to form a closed canal whose commencement is at the mouth of the ejaculatory duct, the ending being at the glans penis. In the female the edges of the urogenital sinus do not unite, but form the *vestibulum vaginæ*. The female urethra is formed by the endodermal portion of the urogenital sinus. It corresponds, embryologically, to the upper half of the *pars prostatica*, and, like the latter, serves exclusively as a urinary passage. That portion of the male urethra which is formed by the ectodermal urogenital sinus serves not only for urinary purposes but also is the means of exit of the spermatozoa.

The length of the male urethra varies not only in different individuals, but also in the same individual, depending on the presence and the degree of hyperemia. In the adult male a long urethra is said to be one that measures about 10 inches in length; a short urethra measures about 6 inches. The average length of the adult male urethra is 8 inches.

The average length of the *pars fixa* of the urethra in the adult male is $4\frac{1}{2}$ inches; that of the *pars pendulosa*, $3\frac{1}{2}$ inches.

The urethra is divided into four portions: (1) Intravesicular portion,* $\frac{1}{2}$ inch; (2) prostatic portion, 1 inch; (3) membranous portion, $\frac{1}{2}$ inch, and (4) cavernous portion, 6 inches.

THE INTRAVESICULAR PORTION.

This portion of the urethra is ill-defined and in many animals may be absent. It is well-marked in the human male, owing to the moving upward of the ureteral openings. In the primitive state, the ejaculatory ducts and the ureteral openings lie close together, and the ureters open directly into the urethra. The urinary bladder must be looked on as a later development, one which serves merely as a reservoir. The original urinary passages consist of ureters and urethra and the trigonum, which corresponds, embryologically, to the intravesicular portion of the urethra.

The intravesicular urethra is triangular in shape, and is bounded at each posterior angle by the orifice of the ureters. The anterior inferior angle is occupied by the orifice of the prostatic urethra. Passing from one ureteral opening to the other, is a fold of mucous membrane forming a curve, which is caused by the projection of muscular fibers which join the two ureters. This fold is called the *plica ureterica*.

The muscular fibers of the intravesicular portion of

*Kalischer: Die Urogenitalmuskulatur des Dammes, Berlin, 1900.

the urethra are continuous above with the muscular fibers of the ureters, and below with those of the urethra; but there is no connection whatever between the muscular fibers of the *trigonum vesicæ* and those of the bladder. The muscular fibers of the bladder are much coarser than those of the intravesicular urethra, and the muscular network of the bladder is much looser than that of the urethra.

The mucous membrane of the *trigonum vesicæ* contains glands similar to those found in the other parts of the urethra. No glands are found in the mucous membrane of the bladder. The color of the mucous membrane of the intravesicular urethra of the living subject is darker than that of the bladder. The epithelial covering of this mucous membrane is of the stratified squamous variety.

In persons having only one kidney the *trigonum vesicæ* is absent.

THE PROSTATIC URETHRA.

The prostatic urethra is that portion of the urethra which lies between the intravesicular and the membranous parts. Its length varies between $\frac{3}{4}$ to 1 inch. Its mucous membrane is covered by epithelium, which in the upper portion resembles the epithelium found in the intravesicular portion of the urethra, and in the lower portion resembles the epithelium covering the mucous membrane of the membranous part of the urethra.

At about the middle of the floor of this canal is a well-marked longitudinal ridge, the *colliculus seminalis*.

which is formed by the elevation of the mucous membrane and the underlying tissues. The upper end of the *colliculus* is lost in the orifice of the bladder; the lower end terminates abruptly, but is continued as a smaller ridge, the *crista urethralis*. This small ridge terminates at about the middle of the membranous urethra in a bifurcation.

On the slope of the lower part of the *colliculus* are the slit-like openings of the ejaculatory ducts. Between these is found a depression, the *utriculus prostaticus*, or, as it has been designated by Weber, who discovered it, the *uterus masculinus*. This structure is developed from the lower ends of the rudimentary Muellerian duct, and is therefore homologous with the uterus in the female.

On either side of the *colliculus seminalis* may be seen a slightly depressed fossa, the prostatic sinus, whose floor is perforated by the orifices of the prostatic ducts.

The anatomical relation of this portion of the urethra to the prostatic gland makes it necessary to review briefly, at this time, the anatomy of the prostate gland.

According to Toureux,* the first vestiges of the prostate gland appear during the third month of intrauterine life in the form of a solid cord-like epithelial outgrowth from the urethral epithelium. In the fourth month this bud of epithelium becomes bifurcated, branching out to both sides, and in the fifth month the principal processes become hollowed out.

* Toureux: Du tubercle chez le fœtus humain. Jour. de l'anat., et de physio., 1889, T. 25.

The gland in the adult consists of from 30 to 50 lobules. Its excretory ducts are quite long ($\frac{1}{2}$ of an inch), and narrow ($\frac{1}{250}$ of one inch).

The intracellular tissue of the gland consists of connective tissue and muscle fibers.

Ruedinger* found that the intercellular tissue constitutes from one-half to two-thirds of the bulk of the gland in some cases, while in others the glandular tissue predominated, even to the extent of constituting five-sixths of the bulk of the gland.

The prostate gland of the adult resembles a chestnut in size and shape. Its base is directed upward and backward, and rests against the bladder. It is perforated for the passage of the *uterus masculinus*, and the ejaculatory ducts. This canal divides the base into a ventral and a dorsal plate. The dorsal plate is the thinner of the two, and is called the *isthmus or commissura prostatica*. The ventral plate corresponds to the middle lobe of the prostate gland.

The apex of the gland is directed forward and downward, and touches the deep layer of the deep perineal fascia. The two side lobes are connected with each other by the isthmus.

The posterior surface of the gland, which rests on the rectum, is smooth and flat, and is marked by a slight longitudinal furrow, the *incisura prostatica*. The anterior surface is convex. It is placed about $\frac{3}{4}$ of an inch behind the lower part of the *symphysis pubis*.

*Ruedinger: Zur Anatomie d. Prostate, München, 1883.

THE MEMBRANOUS URETHRA.

The membranous urethra extends from the apex of the prostate gland to the bulb of the penile urethra. It measures about ½ inch in length. The longitudinal folds of mucous membrane are very well-marked in this portion of the urethra. All of these folds, except the *crista urethralis*, disappear when the urethra is distended.

The epithelium covering this portion of the mucous membrane is of the non-ciliated simple columnar type. The mucous membrane of the posterior urethra is surrounded by two layers of non-striated muscle fibers. The fibers of the inner layer run in a longitudinal direction, and the fibers of the outer layer in a circular direction. The longitudinal fibers are continuous with those of the intravesicular portion of the urethra.

The circular muscle of the male urethra is interrupted in its continuity and arrangement by the prostate gland, which forces its lobes between the fibers of the muscle coat, causing either a displacement or an absorption by pressure atrophy. In the female, this muscle forms a continuous circular coat, which gradually increases in thickness as it approaches the posterior end of the urethra, where it constitutes, in the female as well as in the male, the *sphincter vesicæ triagonalis* (Kalischer), which is identical with what is ordinarily termed the *sphincter vesicæ.*

The investigations of Reliquet, Frank, Langley, Sherington, Zuckerkandl and Zeissl have shown that this muscle is in a state of involuntary tonic contraction (*sphincter tonus*), and when in a state of rest it keeps

the urethra closed, preventing the accumulating urine from leaving the bladder, except when its nerves are stimulated during the act of micturition, when the muscle relaxes. This muscle joins the transverse muscle fibers of the bladder, but it does not exchange fibers with the latter.

Peripheral to the involuntary muscles the urethra is surrounded by a uniformly striated circular muscle, which Kalischer named the *musculus sphincter urogenitalis*. In the adult its course and outline have been modified by changes taking place in the growing bony pelvis and the rapid growth of the prostate and of Cowper's gland. The posterior part of this muscle is described by Henle, who made his investigations on the adult male, as the *sphincter vesicæ externus*. Its function in the adult male has been changed from a compressor of the urethra to a compressor of the gland, and it is now a part of the sexual apparatus.

The middle portion of the *sphincter musculus urogenitalis* lies in the membranous portion of the urethra, and is known as the *compressor urethræ*, *accelerator urinæ*, or *sphincter urethræ membranacea*, but inasmuch as it is a voluntary muscle, it cannot perform true sphincteric duties.

The non-striated muscle and the sphincter of the membranous urethra, which in this location is about four or five times as thick as the former, surround the urethra on the ventral and lateral surfaces. On the dorsum the fibers of both these muscles loose their circular course, interlace freely with each other, thus

surrounding the membranous urethra in the form of a loop.

The sphincter of the membranous urethra and the deep transverse muscle of the perineum form a three-cornered muscle plate, which spreads out in the pubic arch. The membranous urethra penetrates this muscle plate at about its middle, where the plate is about as thick as the urethra is long. The muscle plate is covered on both sides by fascia. The fascia covering the under surface is sometimes called the *ligamentum triangulare urethræ*. Cowper's glands are situated just behind this ligament on either side of the urethra.

CAVERNOUS URETHRA.

The cavernous urethra is the longest of the four divisions of the urethra. It corresponds to all of the anterior urethra. Its average length is about 6 inches. It extends from the termination of the *pars membranacea* to the *meatus urinarius*. It presents two dilatations, one at the bulb and the other at the *fossa navicularis*. For descriptive purposes, it is sometimes divided into bulb and shaft.

This is the only portion of the urethra which contains the crypts of Morgagni and the glands of Littre. One of the crypts of Morgagni, which is larger than any of the others, is situated in the *fossa navicularis* about 1 to 1½ inches from the external orifice. It is called the *lacuna magna*. The glands of Littre occasionally reach into the spongy and cavernous bodies, and may even form conglomerations there. Lichtenberg found

3240 glands in one square centimeter of the urethral mucous membrane;* this would make about 20,000 to the square inch. The excretory ducts of these glands are long and often end in the crypts of Morgagni.

In the posterior third of the *pars cavernosa* are the slit-like openings of the excretory ducts of Cowper's glands. Each duct is two to three millimeters long. The proximal end of the duct pierces the inferior layer of the deep perineal fascia, traverses the bulb, and then courses in the submucosa of the shaft until it opens on the surface of the mucous membrane.

The walls of the urethra are collapsed, and the several parts of the canal can be distinguished with ease by the form that is assumed by the collapsed canal. If transverse sections were to be made, we would find a vertical slit in the glans penis, a horizontal slit in the *pars cavernosa*, a star-shaped slit in the *pars membranacea*, and a slit like an inverted *Y* in the *pars prostatica*.

*Lichtenberg, Zeitschr. f. Urologie, Bd. I, H. 12, Dec., 1907.

CHAPTER II.

PATHOLOGY OF GONORRHEA.

THE GONOCOCCUS.

In 1879 Neisser found an organism of characteristic shape and position in the discharges of a large number of cases of gonorrhea occurring in both men and women. Bumm was the first to cultivate the germ on artificial media, and he also succeeded in reproducing the disease by inoculating the female urethra with a pure culture of the organism in its twenty-second generation. The gonococcus has a biscuit-shape, or as Bumm calls it, a coffee bean shape; that is, the oblong body shows in the middle line a light streak.

The average length of the gonococcus is 1.25 microns and the average transverse diameter is from 0.6 to 0.8 microns. The size varies considerably, especially in cultures. In the urethral discharges the organism is found usually occupying the cells and in irregular heaps in the protoplasm of the polynuclear leucocytes, but never in nucleus of the cell.

The gonococcus is stained easily with all the anilin dyes. It is negative to the Gram stain, that is, it is decolorized. This is an important point in diagnosis. The best stain and the one used most widely for staining the gonorrheal discharges is Loeffler's alkaline methylene blue.

Methylene blue, gentian violet and Bismarck brown are anilin dyes. The first-named is used in Loeffler's alkaline methylene blue stain, and the two last-named are used in the Gram stain. These anilin dyes are on the market in the form of dry crystalline powder. When ordering, it is best to specify Gruebler, since his products

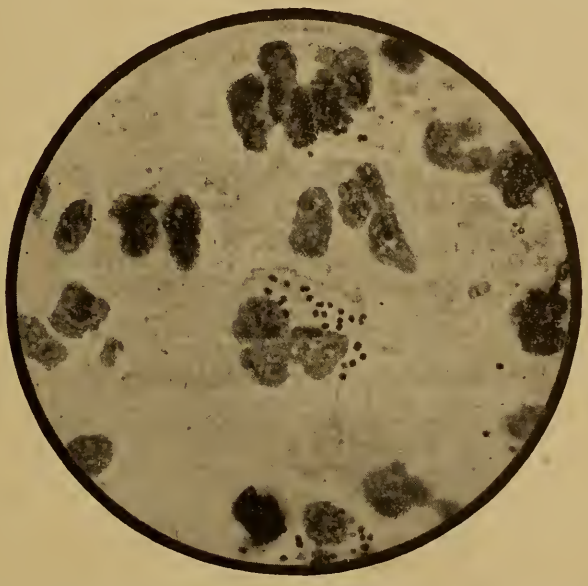

FIG. 1.—Specimen of gonorrheal pus. Leitz: Oil immersion $\frac{1}{12}$ ocular No. 1. The middle of the microscopical field shows a polynuclear leucocyte whose cellbody contains a number of gonococci.

are the most reliable. The so-called stock solutions of these stains should always be at hand; from these small quantities of stain are prepared for immediate use, as they deteriorate if kept for some time. They are put in small bottles with stoppers and pipettes.

The stock solutions are made by adding one part of the powered dye to four parts of absolute alcohol. A

glass stoppered bottle is filled to one-quarter of its capacity with the dye and sufficient absolute alcohol is added to fill the bottle. An excess of dye may be used to ensure saturation. The excess remains undissolved in the bottom of the bottle.

In Gram's method of staining anilin water gentian violet is used; it is prepared as follows: A teaspoonful (4 grams) of anilin oil is shaken thoroughly with $2\frac{1}{2}$ ounces (72 grams) of water. The mixture is filtered through filter paper until it is perfectly clear. To 10 teaspoonsful of the filtrate one teaspoonful of concentrated alcoholic solution of gentian violet is added. This stain decomposes easily, however, and should be prepared in small quantities only.

The Gram staining is performed in the following way: A thin film of the material to be examined is prepared on a slide, dried in the air and fixed in the flame. It is stained for three to five minutes with the anilin water gentian violet. Pour off the stain, wash with water and immerse the specimen in Gram solution.

Gram solution has the following formula:

Iodine,	15 grains.
Potassium iodide,	3i
Distilled water,	Oj.

Stain until the specimen turns a dark brown color. Wash with 95 per cent. alcohol until the color ceases to be given off, and the preparation is of grayish color. Bismarck brown may be used as a counterstain. Wash the specimen in water and mount in Canada balsam.

Bismarck brown stain is prepared from the stock

solution by adding 25 drops of the solution to one ounce of distilled water.

Loeffler's alkaline methylene blue is made as follows:

Sat. alcohol sol. of methylene blue, ... 30
Sol. potass. hydra. (1:10,000), ... 100.

The gonococcus does not grow on the culture media used ordinarily. It can be cultivated on human blood serum and particularly on human blood serum agar, as was shown by Wertheim. It can also be grown or cultivated on the blood serum of the hog, but not so successfully. It grows equally well on an alkaline, acid or neutral medium, nor is it necessary to add salt. A pure culture of the gonococcus can be kept alive for weeks, provided the medium contains sufficient moisture. The organism is not very resistant to high temperatures. Its temperature optimum is 36° Celsius; the mean and extreme temperature is 26° and 39° Celsius. The gonococcus succumbs in six hours to a temperature of 40° Celsius.

The *bacillus pyocyaneus*, *bacillus typhosus*, *staphylococcus*, and *cholera bacillus* have an injurious influence on the growth of the gonococcus, either because of toxins elaborated by these germs or because of their decomposition products. It is impossible to produce an experimental gonorrhea in animals, although the animal can be killed with the gonococcus poison when this is produced elsewhere. The gonococcus is toxic for animals, but not infectious.

In men its pathogenic properties are equal to those

of the other pus-producing microorganisms. At the point of entrance of the gonococcus a localized inflammatory process is set up, and from here metastasis to the various viscera take place. The gonococcus has been found circulating in the blood, and it is known to produce both septicemia and pyemia.

Filtrates of cultures of the gonococcus are devoid of any poisonous qualities, and are not toxic either for man or for animals, unless some of the cocci have broken down, as sometimes happens in the case of old cultures. The subcutaneous injection of dead cocci is followed by a decided reaction which is manifested locally by an inflammation and systemically by fever. It is evident, therefore, that the gonococcus produces an endogenous toxic substance which is free in the animal and causes intoxication, but the germ does not produce any free toxin.

The gonococcus does not convey any immunity against subsequent infections, although, after a time, it loses its virulence for the urethral mucous membrane on which it has had its habitat. When this germ is transplanted to another urethra, it produces an attack of gonorrhea, usually acute, although occasionally the disease takes a chronic course from its inception.

ACUTE GONORRHEA.

The gonococcus which is thus transplanted propagates itself on and in the urethral mucous membrane, doing harm to the structures with which it or its metabolic products come in contact.

The human body responds to the injurious invasion by a localized inflammatory hyperemia, accompanied by suppuration and edema of the part affected. The hyperemia is nature's most potent means of arresting and eliminating the infection.

However, the infection is not always limited to the mucous membrane. It may invade the spongeous and even the cavernous bodies. The meshes of the erectile tissue are infiltrated. There is present endarteritis as well as periarteritis, and the veins are in a state of phlebitis. Fibrous coagula may form in the vessels of the parts most involved in the inflammatory process. The state of the lymph vessels is the same as that of the blood vessels. The lymph glands are swollen and tender to touch. Under certain conditions they may suppurate. All of the glandular structures of the mucous membrane are involved in the inflammatory process, a fact which is of special importance because of the prominent part played by glandular infection in chronic gonorrhea.

In the excretory duct there is a marked epithelial proliferation, while the wall of the duct is thickened considerably by the infiltration of embryonal cells and leucocytes. The infiltration of the erectile tissue is limited mostly to the tissues surrounding the glands.

According to observations made, these inflammatory processes start from the *fossa navicularis*, where the infection first establishes itself, and then spread over a more or less limited area.

As a rule, the inflammation spreads upward along the

course of the entire urethra, but its severity generally decreases with the distance from the primary focus of infection. It follows, therefore, that gonorrhea may be limited to the anterior urethra, although it may spread to the posterior urethra.

Mention must be made at this point of the action of the sphincter of the membranous urethra and its supposed power of limiting gonorrhea to the anterior urethra. This muscle is believed to keep the urethra closed or collapsed by a firm tonic contraction, thus preventing the spread of the gonorrheal infection from the anterior to the posterior urethra. But this muscular plate, which surrounds the membranous urethra and is enclosed by the two layers of the triangular ligament, is made up of striated voluntary muscle fibers, which, according to physiologic laws, are relaxed when in a state of rest and generally do not have a sphincteric action. Suppose, for a moment, that this muscle were a true sphincter, and that it did keep the urethra tightly closed; then the question would arise, whether a sphincter muscle has the power of arresting an infection as virulent as that of the gonococcus? This can unhesitatingly be answered in the negative.

Finger stated that posterior infection occurs in from 60 to 80 per cent. of all cases of gonorrhea. Jadassohn gives the percentage as being from 60 to 70. Therefore, we consider the affection of the posterior urethra as being a part of and not a complication of the gonorrhea.

After some weeks, especially under rational treatment, the acute inflammation subsides. The gonococci

diminish in number, the pus gradually disappears, and the infiltration is absorbed, at least in part. The congestion of the blood vessels lessens and the epithelium attempts to regenerate itself, although in doing so it does not resume its original columnar form.

In the meantime, all the objective manifestations of the disease may have disappeared; there is no more discharge of pus from the meatus, and a microscopic examination of a smear preparation of the discharge may fail to reveal any gonococci. Nevertheless, the gonococci have not disappeared entirely. They are hidden in the depths of the tissues, lying in the smaller or larger masses of infiltrates that have remained unabsorbed, and in the lumina of the infected glands. The urethroscope usually reveals these lesions in the mucous membranes. They mark the onset of a chronic gonorrhea. It is, therefore, of importance to be mindful of the fact that the apparent absence of gonococci does not justify discharging the patient as cured.

CHRONIC GONORRHEA.

Chronic gonorrhea is the result of the progressive changes which take place in the inflammatory foci which remain after the acute stage of the disease has passed. Speaking pathologically, a chronic gonorrhea is said to begin with the first deposit of connective tissue fibers in the patchy cellular infiltrations of acute gonorrhea. The time of its appearance varies, but it usually takes place at about the end of the second month of the acute

infection. Its onset is marked usually, although not necessarily, by a decrease in or an amelioration of acute symptoms.

The most important lesions of a chronic gonorrhea take place in the mucosa proper. Their commencement is marked by the appearance of an inflammatory infiltrate, more or less rich in embryonal cells, pus corpuscles, and epithelioid cells. This infiltration may be so intense as to cause the outlines of a corium to vanish entirely. The infiltrate invades the glands and crypts and their surrounding tissues, which also become well vascularized by the formation of new blood vessels. In this way it happens that the surface assumes a granulating appearance, which in extreme cases results in the production of papillomata.

The crypts of Morgagni are invaginations of the mucous membrane. Their structure is identical with that of the mucous membrane. The infiltration of the pericryptic tissue with embryonal cells and leucocytes, and the vascular dilatation which accompanies this infiltration cause a swelling of the crypts and a crater-like gaping of their mouths. The subsequent fibrous change shows itself in one of two ways. These crypts either retreat, atrophy and disappear, or their excretory ducts are stopped up. The crypts themselves are filled with cellular debris and are thus transformed into cysts, which appear on the surface of the mucous membrane as whitish nodules. In rare instances these cysts suppurate, producing periurethral abscesses and fistulæ.

CHAPTER III.

DIAGNOSIS OF GONORRHEA.

INSPECTION AND PALPATION.

While the patient undresses, carefully inspect his clothing. The discharges of an acute gonorrhea usually produce spots on the clothing that have well-defined borders and that are greenish-yellow in color. When the urethritis is subacute or chronic in character, the discharge produces large, ill-defined and only slightly pigmented spots. Next, note whether any inflammatory changes are present, such as redness and swelling of the lips of the meatus. Observe carefully the nature of the discharge from the urethra; whether it is rich, creamy or milky, or only mucoid in character. If the flow is scanty, the urethra will be found glued together, and on forcing it open a small quantity of pus escapes. It is always well to know how long it is since the patient urinated, and when the secretion is very scant, it is advisable to see the patient early in the morning, before he has emptied his bladder.

If no pus appears spontaneously, rub the lower surface of the urethra lightly from the bulb forward, and if this also fails to force out any discharge, then the urine should be examined in divided portions for inflammatory products. For this purpose one of the "glass

tests" should be used. This will also furnish some information as to the location of the affection.

The simplest of these tests is Thompson's two-glass test. The patient is asked to urinate into two glasses, approximately one-half of the flow being emptied into each glass. The first glass contains the pathologic products of the urethra, while the second glass contains the urine as it comes from the bladder. Cloudiness of the first portion and clearness of the second portion of urine point toward disease of the urethra. When pathologic products are found in both portions of urine, there is present an affection of both the urethra and the bladder. The latter statement is true only when the inflammatory process is not an acute one.

In an acute gonorrhea the production of pus usually is so profuse that both portions of urine are turbid, even in those cases where the disease is confined to the anterior urethra. In the case of a posterior urethritis, some of the secretion may flow back into the bladder, when it becomes mixed with the urine contained in the bladder, thus clouding the second portion of urine voided.

The pathologic products contained in the last portion of urine voided deserve special study because contraction of the muscles may press out some of the secretion of the prostate gland and the seminal vesicles. For the porpose of studying this urine, Jadassohn instituted the three-glass test. The same procedure is followed as in the Thompson test, except that just before the bladder is emptied entirely, the patient urin-

ates into a third glass, which will contain what is called the prostatic urine.

More accurate information as to the location of the pathologic changes in the urethra may be obtained by the use of a method first proposed by Goldberger, the so-called diagnostic irritation method, and elaborated by Kollmann, who called it the five-glass test. If possible, this test should be made in the morning. With the patient standing, a straight catheter is introduced into the urethra up to the bulb. Irrigation is made with a large hand syringe. Not much pressure should be exerted, and there should be enough space between the catheter and the wall of the urethra to permit of the return of the irrigating solution. A clear aseptic or slightly antiseptic solution is used. The irrigation is continued until the fluid returns clear. The patient is then asked to urinate into three glasses, as is done in Jadassohn's method. In the first glass are placed the first washings of the anterior urethra, and in the second glass the last. The third glass contains the pathological products of the posterior urethra; the fourth glass those of the bladder, and the fifth glass those of the prostate gland.

The test may be made more valuable by massaging the prostate before the last portion of urine is passed. Instead of the entire anterior urethra only sections of it may be washed out and the washings examined separately.* Phimosis, balanitis, lymphangitic streaks, urinary filtrations, fistulas, varicocele, hydrocele, epididymitis, and orchitis should be looked for. The entire

*Young: Johns Hopkins Hospital Report. Vol. 13, 1906.

urethra is palpated. It is either smooth throughout or rough and rigid in some parts. The normal urethra slides smoothly between the ends of the fingers. It is also advisable to palpate over the sound. The membranous and prostatic urethra are palpated best with the fingers in the rectum. The female urethra is palpated easily through the vagina. If no pus appears spontaneously the urethra is emptied by massage. The finger after passing the pubic arch is well pressed upward in front of the pubic bone.

FIG. 2. Bougie a boule.

INSTRUMENTAL EXAMINATION.

In all acute inflammations of the urethra instrumental examination is contraindicated. The most convenient instruments for endourethral examination is the elastic bulbous bougie, Guyon's *explorateur a boule olivaire*, or *bougie a boule*. (Fig. 2.) The *bougie a boule* carries on a slender shaft an olive-shaped head which is conical at its digital end and sharply cut off at its proximal end. The olive of the most frequently used bougies has a diameter of 18 to 20, French scale. It is advisable to have the entire set of bougies, ranging in size from 8 to 26. In the normal urethra the bougie passes through the anterior portion smoothly and without any resistance. At the isthmus a slight obstruction is encountered. When this obstruction is passed, the patient is conscious of

the maneuver. In the whole length of the membranous urethra the bougie passes through less freely, while in the prostatic portion it moves easily until the internal orifice is reached, when a slight constriction is encountered just before the bougie enters the bladder. In some instances the bougie may be caught in the prostatic sinus. (Dittel.)

While passing through the prostatic urethra, the patient usually has a desire to urinate. The largest diameter of the head of the bougie being at its proximal end, the obstructions in the urethra are felt more plainly when the bougie is withdrawn than when it is introduced. In some cases the meatus is so small that it must be cut before an examination can be made. Occasionally in the young, and very often in the old, the bulbous urethra is very wide, so that the end of any inelastic instrument is caught in a sort of cul de sac. This obstruction may be overcome by lengthening the urethra by traction. Immediately behind the bulb is the isthmus, which usually can be passed readily, except in the case of very nervous individuals whose membranous urethra generally is hyperemic. Then there is a reflex spasmodic contraction of the "membranous sphincter." A few drops of cocaine solution and a little patience on the part of the operator will overcome this obstruction.

Any obstructions in the course of the urethra, except those mentioned above, are pathologic in nature. In the case of a stricture a sensation of unevenness is imparted to the examining finger through the instrument.

urethra is palpated. It is either smooth throughout or rough and rigid in some parts. The normal urethra slides smoothly between the ends of the fingers. It is also advisable to palpate over the sound. The membranous and prostatic urethra are palpated best with the fingers in the rectum. The female urethra is palpated easily through the vagina. If no pus appears spontaneously the urethra is emptied by massage. The finger after passing the pubic arch is well pressed upward in front of the pubic bone.

INSTRUMENTAL EXAMINATION.

In all acute inflammations of the urethra instrumental examination is contraindicated. The most convenient instruments for endo-urethral examination is the elastic bulbous bougie, Guyon's *explorateur a boule olivaire*, or *bougie a boule*. (Fig. 2.) The *bougie a boule* carries on a slender shaft an olive-shaped head which is conical at its digital end and sharply cut off at its proximal end. The olive of the most frequently used bougies has a diameter of 18 to 20, French scale. It is advisable to have the entire set of bougies, ranging in size from 8 to 26. In the normal urethra the bougie passes through the anterior portion smoothly and without any resistance. At the isthmus a slight obstruction is encountered. When this obstruction is passed, the patient is conscious of

FIG. 2. Bougie a boule.

the maneuver. In the whole length of the membranous urethra the bougie passes through less freely, while in the prostatic portion it moves easily until the internal orifice is reached, when a slight constriction is encountered just before the bougie enters the bladder. In some instances the bougie may be caught in the prostatic sinus. (Dittel.)

While passing through the prostatic urethra, the patient usually has a desire to urinate. The largest diameter of the head of the bougie being at its proximal end, the obstructions in the urethra are felt more plainly when the bougie is withdrawn than when it is introduced. In some cases the meatus is so small that it must be cut before an examination can be made. Occasionally in the young, and very often in the old, the bulbous urethra is very wide, so that the end of any inelastic instrument is caught in a sort of cul de sac. This obstruction may be overcome by lengthening the urethra by traction. Immediately behind the bulb is the isthmus, which usually can be passed readily, except in the case of very nervous individuals whose membranous urethra generally is hyperemic. Then there is a reflex spasmodic contraction of the "membranous sphincter." A few drops of cocaine solution and a little patience on the part of the operator will overcome this obstruction.

Any obstructions in the course of the urethra, except those mentioned above, are pathologic in nature. In the case of a stricture a sensation of unevenness is imparted to the examining finger through the instrument.

The sensation is that of the bougie jumping over a hard string. If the stricture is so tight that it cannot be passed by the bougie, the filiform bougie must be used, commencing with the smallest number and increasing the size gradually until the diameter of the stricture is ascertained. Many strictures are hard and ridge-like and stand out prominently from the surrounding mucous membrane. It is possible for the filiform bougie to be caught in a pocket of the mucous membrane, or it may enter the narrow passage of the stricture somewhere at its middle. It is, therefore, a good plan not to try to pass the stricture with the first bougie, if it is caught in a pocket. A second bougie is introduced, and so on until either all the blind pockets have filled out with bougies, or until one bougie passes through the stricture.

We may use conical or cylindric metal sounds in place of the bougies, but the information they impart cannot be compared with that given by the bougies. The infiltrations met with in chronic gonorrhea may be detected by passing a sound into the urethra and palpating with the hand on the surface. The membranous and prostatic urethra are palpated through the rectum.

The introduction of a bougie into the urethra enables us not only to ascertain the degree of sensitiveness and character as to smoothness of the urethral mucous membrane, but it also is an easy means to determine the length of the urethral canal. The instruments most suited for this work are Kutner's graduated bougie.

URETHROSCOPY.

In a large percentage of cases of chronic gonorrhea, the pathologic changes consist in widespread infiltrations of a slight degree, but may cause serious disturbances. In other cases these changes are confined to small aggregations of inflamed and suppurating glands or crypts which, in spite of their small size, perpetuate the virulent infection and cause a constant discharge of pus. On the other hand, it is by no means certain that the existence of this condition is made manifest by symptoms. There may be no secretion whatever, and the urine may not contain filaments for weeks or months, or even for years. Suddenly the patient is attacked by an acute gonorrhea, without having exposed himself to the infection. Such cases are by no means rare. The endo-urethral examination with the bulbous bougie, the sound and the urethrometer, while ordinarily of great service, in making a diagnosis, gives little information in these cases. They remain, therefore, a mystery to the insufficiently equipped physician, and it is because of this that chronic gonorrhea is said to be incurable.

In order to treat a disease successfully, a correct diagnosis must first be made. The most important instrument with which to make a thorough examination is the urethroscope. The technic of urethroscopy is easy, but in order to draw correct conclusions from the results obtained with the urethroscope much experience is needed as well as a thorough knowledge of the pathology of gonorrhea. The lack of these qual-

ifications on the part of the clinician probably explains why some textbooks on surgery speak lightly of this method of examination.

Nitze, Oberlaender, Kollmann and Valentine have given us a urethroscope to be described below. It

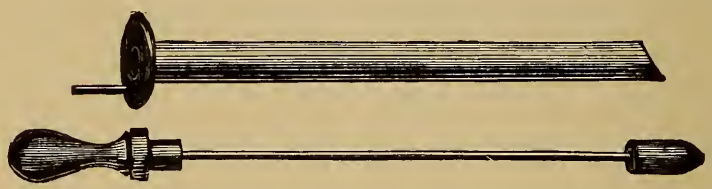

FIG. 3.—Urethroscopic tube with obturator.

consists of a tube and obturator (Fig. 3), and a light-carrier with an incandescent lamp (Fig. 4). The urethroscopic tube carries at the visual end the disc, which holds a spur for the attachment of the light-carrier. The digital portion of the urethroscope is

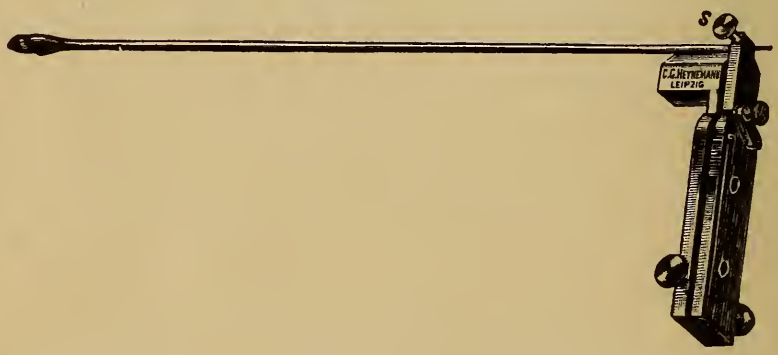

FIG. 4.—Light-carrier with incandescent lamp.

cut off obliquely from the upper to the lower wall. Each tube is provided with an obturator which has stamped on its handle a number corresponding with that of the tube to which it belongs, and indicating the diameter expressed in Charrière scale. No. 30 is

equal to 10 millimeters, or one centimeter ($\frac{2}{5}$ inch). The distal end of the obturator is conical in shape, it closes the tube, and permits of easy introduction of the instrument into the urethra. It has a slit which facilitates its removal and prevents any suction action on the mucous membrane, with a consequent laceration.

Kollmann uses a set of urethral tubes ranging in size from 21 to 31 Charrière. Valentine, of New York, uses a set ranging in size from 22 to 32 Charrière.

The light-carrier constructed by C. G. Heynemann, of Leipzig, consists of a delicate metal tube open at both ends. At the distal end it supports a cup, which receives the incandescent lamp. To the proximal end is fastened at right angles a handle provided with a switch. Attached to one pole of the lamp is a long insulated wire which, when introduced into the tube of the light-carrier, is caught at the proximal end by a screw, which penetrates the insulation when tightened and completes the circuit.

The other pole is provided with a short, not insulated, wire, which remains in contact with the wall of the tube of the light-carrier. Before beginning the urethroscopic examination, the apparatus should be tested. The incandescent lamp should throw a clear white light. The electricity is best furnished by a storage or a dry battery, because the transformers, especially the portable varieties, are still very unreliable.

The operator and his assistant wash their hands with the same care and thoroughness as is done for a surgical operation. The urethroscopic tubes and ob-

turators are boiled both before and after the examination. In special cases it is necessary to boil the light-carrier. The screw which fastens the lamp to the light-carrier is loosened, and the lamp is taken out. The lamp can be disinfected in a germicidal solution, or it can be thrown away. The latter is the more advisable, if the apparatus has been used in a tuberculous case.

In some cases it is advisable to anesthetize the urethra with a three per cent. solution of cocaine. Kollmann constructed a syringe (Fig. 5) of two cubic centimeters volume, which is provided with exchangeable

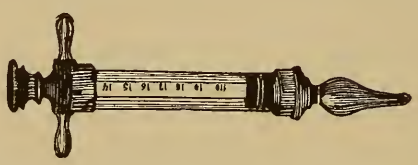

Fig. 5.—Kollmann's cocaine syringe.

tips. These tips are boiled after each examination and are kept in a solution of bichloride of mercury ready for further use. The cocaine solution is kept in contact with the urethral mucous membrane for about five minutes. The absorption of the fluid can be aided by slight massage of the parts to which the solution has been applied.

The cocaine slightly changes the appearance of the mucous membrane; therefore, the first examination should be made previous to the application of the cocaine. If a dilatation follows the urethroscopic examination, it is best to postpone the cocainization until after the examination.

If the meatus is found to be too narrow to admit of the passage of the smallest-sized urethroscopic tube, we should try to stretch it as much as is necessary. If a sufficient dilatation has not been attained after three or four attempts, meatotomy is indicated. It is best performed by means of Oberlaender's meatotome (Fig. 6). Before the urethroscopic tube is introduced, it should be lubricated with sterile glycerine, or, if the meatus is tight, sterile vaseline or oil may be used instead of the glycerine. As a rule, however, oily sub-

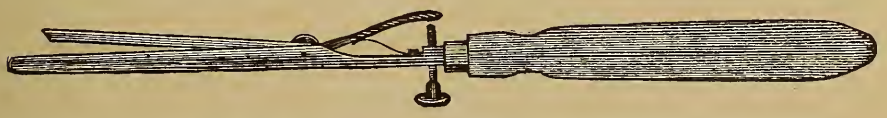

FIG. 6.—Oberlaender's meatotome.

stances should not be used if their use can be avoided, because they are not soluble in water, and they can be removed only with difficulty.

The operator takes his position to the left of the patient. He holds the urethroscope in his right hand, while with the fingers of the left hand he opens the meatus. Having passed the *fossa navicularis*, it is not difficult to push the tube to the end of the bulb. Force should not be used in any of these procedures, because in certain pathologic conditions the mucous membrane bleeds easily, and this bleeding would interfere with the making of an accurate examination.

When the instrument reaches the bulb, the obtruator is withdrawn and the funnel formed by the mucous membrane closing in over the end of the tube is dried and cleaned with a pledget of cotton wound round the

end of an uncut match. The cotton must be aseptic.

The light-carrier is then introduced and fastened to the disc. The examination is done by gradually retracting the tube while keeping the funnel clean. Observe any change that takes place in the shape of the funnel and note the appearance of colored fluid. The latter denotes a secretion from the diseased mucous membrane. Throughout the examination the urethroscope should be kept in the long axis of the urethra, so that the walls of the latter can be examined simultaneously. If it is desired to examine a certain area more particularly, the instrument is turned to that side.

The introduction of the straight tube into the posterior urethra is disagreeable to the patient, and the affections of the sexual glands, like those of the prostate, do not show distinctly on the surface of the urethral mucous membrane. For these reasons urethroscopy of the posterior urethra is done less often than of the anterior urethra. Goldschmidt* constructed a urethroscope with an optical arrangement similar to that of a cystoscope. The urethra is examined while distended with water.

In order to examine the posterior urethra, the patient is made to assume the lithotomy position, being placed well to the edge of the table, in order to get a good view of the perineum. The legs are flexed at the knees, the feet being kept a little higher than the body. On entering the posterior urethra with a straight instrument it is necessary to push slowly and carefully, depressing it well while passing the colliculus seminalis below the

*Goldschmidt (Berlin), Münch. med. Wochenschr., Nov. 14, 1907.

horizontal plane. The direction of the force in this region should be from below upward. After passing the colliculus the obturator is withdrawn and the tube, if it is found to have entered the bladder, is retracted to the internal urethral orifice.

The mucosa is cleaned with a pledget of cotton before the light-carrier is introduced. The examination may be interfered with by the escape of urine from the bladder. To overcome this, Kollmann introduces the urethroscopic tube only as far as the anterior border of the colliculus. Encountering a slight obstruction and a certain sensation felt by the patient announce that the end of the tube is in the proper position. In this method it is advisable to depress the point of the tube toward the lower wall of the urethra. Kollmann starts at the *colliculus seminalis* and examines the urethra first from before backward to the internal orifice, and then from behind forward through the entire length of the posterior urethra. Not much can be seen in this part of the urethra when the smallest tube, No. 00= 21 Charrière, is used, but No. 0=23 Charrière permits of a most satisfactory examination. Tube No. 1 =25 Charrière sometimes passes the colliculus with extreme difficulty, occasioning the patient more or less pain. A urethroscopic tube must be held firmly and well in the middle line when these tissues are examined, because the pressure of the muscles and the curve of the urethra easily change its direction and force it out.

The mucous membrane of this portion of the urethra is very delicate. It bleeds very easily, thus preventing

a thorough urethroscopic examination. A second attempt must be made, and this usually is successful.

When examining the anterior urethra, it is best to make it a general rule to use the largest tube that will pass through the meatus. The larger the tube, the better, because a large tube unfolds the mucous membrane and admits a good light for examination. The open excretory ducts of glands are in full view and secretion is pressed out of the infected glands. In view of recent cases it is advisable to begin the examination by using the smallest tube, because the larger tube may disturb the tissues and interfere with the making of a correct diagnosis; or bleeding may take place, and make an examination impossible.

Oberlaender uses a knee-joint obtruator in order to

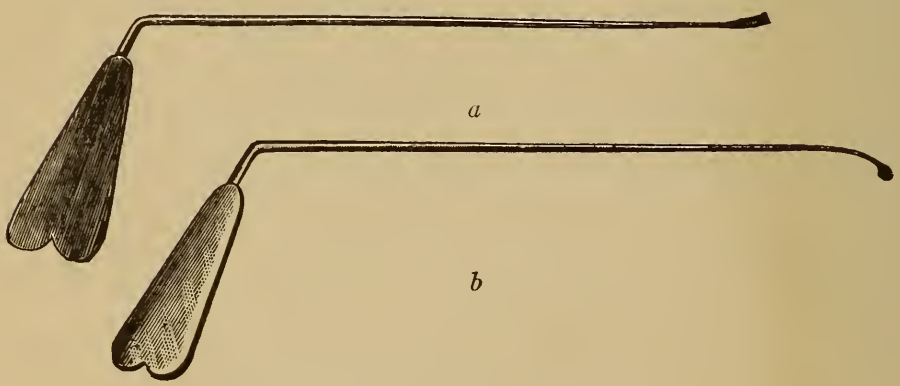

FIG. 7.—*a*, Spatulum. *b*, Curette.

enter the posterior urethra. This instrument has not met with much favor, because the examination can be made without its use. When the meatus is small, Oberlaender sometimes makes use of a dilating tube, constructed like a vaginal speculum. Kollmann and

Oberlaender have devised small spatulas, curettes, pipettes, knives, capillary catheters, electrolytic sounds, straight and bayonet-shaped, with pointed, blunt and bulbous ends, and electric needles with single and double poles. The spatulas (Fig. 7), curettes and

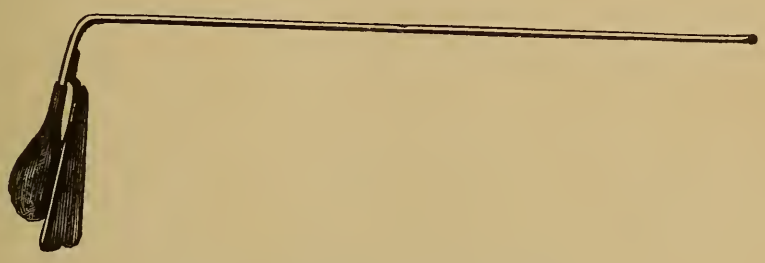

FIG. 8.—Urethroscopic pipette.

pipettes (Fig. 8) are used to secure some of the secretion for microscopic examination from the funnel produced by the mucous membrane or from the crypts of Morgagni.

The small sounds (Fig. 9) are useful to press away

FIG. 9.—Urethroscopic sound.

folds of mucous membrane, to facilitate the inspection of diseased areas, and to find the point of attachment of papillomata, as well as to probe the open excretory ducts of diseased glands. The capillary catheter (Fig. 10) enables us to treat the diseased portion of mucous membrane with strong antiseptics, and it can

also be used to irrigate the crypts of Morgagni. For this latter purpose the catheter is combined with a Guyon drop syringe (Fig. 11).

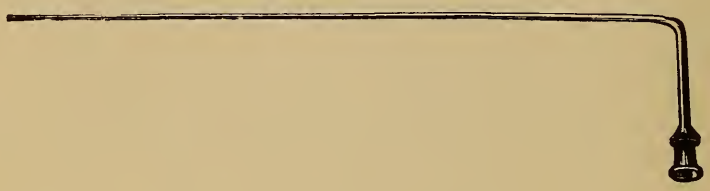

FIG. 10.—Capillary catheter.

The intraurethral knives (Fig. 12) are used to make stabs or incisions into infiltrations and to divide strictures (intraurethrotomy). The bayonet-shaped sounds with blunt or pointed platinum ends are used to destroy

FIG. 11.—Guyon drop syringe.

diseased gland ducts by electrolysis, and also to treat hard infiltrations.

The appearance of the normal mucous membrane of the urethra varies with the general structure of the

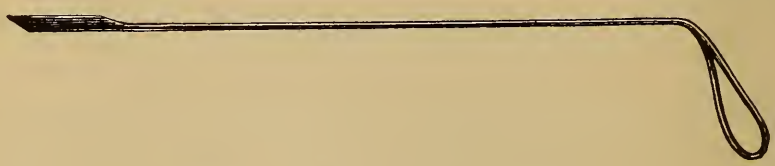

FIG. 12.—Intraurethral knife.

penis. A small penis has a fine delicate mucous membrane, even when the person is tall and strong. This is especially true in the case of individuals who have

a poorly-developed glans penis, and when there are congenital adhesions of the prepuce.

The color of the mucous membrane is dependent on the blood supply. In anemia it is pale and in hyperemia it is of a bright red color. The application of cocaine or pressure by the urethroscopic tube causes the tissue to become pale. Not only do different urethræ show different degrees of red, but there is also a change of color within the same urethra.

The surface of the urethra within the glans penis is devoid of papillæ, and has a very poor blood supply. It is pale in color, and its surface is smooth. The color changes to a deeper red, as soon as the *sulcus caronarius* is reached, and here also the longitudinal folds are first seen. The arrangement of these folds is very similar to that seen in the esophagus, and in the intestinal tract. Their purpose during micturition and erection is apparent. The urethra also has transverse folds, which serve a similar purpose as do the longitudinal.

If the urethroscopic tube is withdrawn during the examination, the transverse folds are obliterated, on account of the traction put on the penis. The operator sees the mucous membrane in the form of a funnel, which shows in its middle a more or less well-defined opening called the central field. This field changes its shape in different sections of the urethra. In the glans penis it is in the form of a vertical, slightly oval slit, immediately behind the glans it is rounded in form, and at the beginning of the cavernous portion of the

urethra it changes gradually into a transverse slit. The farther the advance is made into the bulbous urethra, the more the inferior wall bulges into the field at the expense of the superior, distorting the central field.

The number of longitudinal folds in the normal urethra varies in different individuals, being from four to twelve in number. They are arranged like the spokes of a wheel, and are most marked toward the center of the field. It is advisable to study these folds carefully in the healthy normal urethra, because pathologic conditions are manifested by changes in the shape, number and color of these folds. The normal mucous membrane almost always shows striæ of a beautiful red color, while the mucosa in the background is of a light yellowish-red tint. The striæ are best developed in a well-vascularized surface. They are generally absent in the anemic mucous membrane of a narrow urethra, and here the longitudinal folds are poorly developed.

The excretory ducts of the crypts of Morgagni appear as small, slightly-grooved hollows of the same color or a slightly deeper shade than the surrounding mucous membrane. At times they are large, and there may be seen distinct small cavities which resemble in appearance the prick of a needle. They are seen mostly in the upper wall, but only when a very careful examination is made. In the healthy urethra they are level with the membrane.

The glands of Littre are found throughout the urethra, but are visible only when the mucous membrane

is diseased. They appear as red spots and remain visible a long time after the disappearance of the infection. In many cases these glands are invisible because their outlet is covered over by epithelium and connective tissue.

The excretory ducts of Cowper's glands open into the lower wall of the urethra at the posterior portion of the shaft. In many cases the opening of these ducts is surrounded by a fold of mucous membrane and is then recognized easily in the endoscopic tube. This membranous fold has the shape of an inverted V, the closed end of the V pointing toward the isthmus, the open end toward the external orifice. When this fold of mucous membrane is very well developed, it is often combined with a congenital diverticulum (Kollmann).

This is the appearance of the mucous membrane of the anterior urethra in strong and healthy subjects who have a well-developed penis. In the anemic patient and in those who are poorly developed, the mucous membrane is thick and colorless. It has neither longitudinal folds nor striæ. The condition of this membrane may at first sight suggest a pathologic change but on closer examination the surface is seen to have a uniform appearance, which is never seen in disease.

Another point of importance in arriving at a diagnosis is the smoothness and brilliancy of the lining epithelium.

The color of the normal and well-formed posterior urethra is usually much darker than that of the anterior. In the posterior portion of the prostatic urethra little of interest is found. The funnel is always short and

closed. The mucous membrane is smooth, moist, and dark red in color. Folds are practically absent. While withdrawing the tube there gradually appears in the lower half of the field a projection, the *colliculus seminalis*. While it shows individual differences, it usually presents itself as a low oval-shaped body of the size of a split pea, but rather more elongated. Its size is generally dependent on the caliber of the urethra and the degree of development of the penis. Its surface is generally smooth, but when of large size it appears to be furrowed. This appearance is due to two or three small folds of mucous membrane.

While passing this region the membranous funnel is obliterated almost completely by the projection of the body of the colliculus into the open end of the urethroscopic tube. The mouth of the uterus masculinus is seen in some cases. More seldom do we see the ejaculatory ducts. The openings of the excretory ducts of the prostatic glands which are situated at either side of the colliculus are seen quite often. The appearance of the ejaculatory ducts is similar to that of the crypts of Morgagni. The mouth of the sinus pocularis is large and often is open.

The smallest ducts are the *ducti prostaticæ*, which resemble hypertrophic glands of Littre. Oberlaender found that in cases treated for some time with instillations of a strong nitrate of silver solution, as is done in Guyon's deep injections, an argyrotic discoloration of the mouth of the excretory ducts takes place, making the ducts easily visible. In the adjoining membranous

urethra the continuation of the *colliculus seminalis* is recognized as a more or less prominently projecting ridge of mucous membrane. The ridge usually reaches to or passes the middle of the membranous section of the urethra, although in some instances it is missing. The membranous urethra has a short, closed funnel, and often a large number of longitudinal folds. At the borderline between the membranous and the anterior urethra is the isthmus bulbi of the membranous urethra.

In the posterior urethra the tube is in nearly a horizontal position; it rights itself as soon as its end reaches the anterior urethra, the deviation from the horizontal plane being from 45° to 90°. Further examination should be done between those angles.

The bulb is recognized at once by the sac-like width of the lower half of the wall. The inspection of the intravesicular part of the urethra is done with the cystoscope. It reveals this part of the urethra as a triangular, smooth, glistening surface of a light yellowish-red color. The color is of a deeper red than the surrounding mucous membrane of the bladder, and is caused by a more abundant supply of blood-vessels and by the nearness of the prism of the cystoscope to the mucous membrane of the trigonum. The nearness also causes the blood-vessels to be magnified and brought out more, and the heat caused by the cystoscopic lamp may produce more or less of a hyperemia, especially if the examination lasts for any considerable length of time.

CHAPTER IV.

VARIETIES OF GONORRHEA.

The gross changes in the urethra occurring in the course of a chronic gonorrhea are the result of a progressive pathologic process beginning with the first deposition of connective tissue fibers into the cellular infiltrations seen in the course of an acute gonorrhea and ending with the complete transformation of the cellular elements into scar tissue.

Oberlaender divides the infiltrations of chronic gonorrhea into two main groups, according to the stage to which the deposition of connective tissue has advanced. These two groups are the soft and the hard. The soft infiltrations are those which do not contain any appreciable amount of connective tissue. This stage of the inflammation increases the intensity of the normal red color of the mucous membrane. To the second group belong all those infiltrations in which the deposition of connective tissue is marked. Here the intensity of the red color of the affected mucous membrane is diminished.

Oberlaender subdivides the hard infiltrations into three groups, according to the extent to which the hyperplasia of the connective tissue has encroached on the lumen of the urethra. To the first division belong the infiltrations that are of slight degree, or chronic gonor-

rhea of the first degree, where the lumen of the urethra has not suffered to a marked extent. To the second division belong all the hard infiltrations that are of medium degree, or chronic gonorrhea of the second degree, when the lumen of the urethra has been reduced in size so that a urethroscopic tube, No. 23, cannot be passed without lacerating the tissues. The infiltrations that cause a more pronounced narrowing of the urethra than this belong to the third division, or gonorrhea of the third degree.

Chronic gonorrhea of the first degree and the lesser forms of the second degree correspond clinically to what are termed by Otis, of New York, strictures of a wide caliber. Chronic gonorrhea of the third degree corresponds clinically to what we generally call strictures. Pathologically, a stricture is a diminution in the elasticity of the urethra caused by the deposition of connective tissue in the walls of the urethra, so that every case of chronic gonorrhea is a case of stricture.

On the basis of the pathologic changes that take place in the glands and crypts, Oberlaender further subdivides chronic gonorrhea into the moist or glandular and the dry or follicular varieties. In the glandular form the duct of the inflamed gland is swollen and injected, forming a little projection which at the height of the inflammation may be surmounted by a desquamating and injected mucosa. The discoloration varies from light to blood-red. The mouth of the duct may gape widely, showing the interior, or it may be stopped up with inspissated secretion. Within the area of the

most marked infiltration of the mucosa are found the glands that are most affected; they therefore appear to be more numerous in the center of the patch than at the periphery.

In the follicular or dry form the duct can be seen with a urethroscope only in exceptional cases. According to Neelson, the gland is converted into a subepithelial cyst which is filled with colloid material.

The crypts being simple depressions in the mucous membrane are subject to the same diseases that affect the membrane, but in some instances they alone are infected, the neighboring structures not being involved in the inflammatory process. Under such circumstances the crypt appears as a red projection of about the size of a pinhead. On its side is seen the excretory duct as a small groove with shiny borders. The duct either discharges spontaneously or on pressure. The secretion is more or less purulent in character. If the inflamed crypt is situated in the middle of a patch of infiltration, it projects less above the surface.

In the follicular or dry form, the excretory ducts of the crypts are closed and hidden from view, and the crypts themselves are filled with the inspissated products of inflammation and with cellular debris. They project above the mucous membrane and appear as whitish or yellowish translucent spots. These follicular patches are palpable as hard nodules of about the size of a pea, particularly though when the urethra is dilated by a hard instrument.

The cases of both the moist and the dry varieties of

infiltrations occur with equal frequency. If there is any difference in the frequency of their occurrence, it is in favor of the dry form. The latter is found dissociated from the moist form in cases that have not as yet been subjected to instrumental treatment, such as dilatations, which changes the urethroscopic picture. The glandular openings again make their appearance on the surface, and the follicular form of infiltration is converted into the glandular form as a part of the retrogressive development, which is taking place under the guidance of the graduated dilatation during the process of healing.

The division of chronic gonorrhea into the varieties just described is more or less an arbritary one, and it is used here only for the sake of clearness of description. Of course, by reason of the great diversity of this affection, transitional and mixed cases occur much more often than typical cases.

SOFT INFILTRATIONS.

The clinical features of this affection are embraced in the term subacute gonorrhea. Inasmuch as the inflammation is limited to the mucous membrane, the term urethritis mucosæ given to it by Oberlaender, is an appropriate one. These infiltrations do not produce any appreciable narrowing of the urethra. Any abnormal obstruction to the introduction of the urethroscopic tube would, therefore, exclude the case from this group of infiltrations, unless the obstruction could be explained away by faulty technic.

The soft infiltrations are localized in parts that contain many longitudinal folds, especially in the pars pendulosa, less frequently in the bulb. Usually the process attacks the more dense mucous membranes, and it is of short duration. The intensity of the red color is increased. The pale red of an anemic mucous membrane is changed to a bright rose color; the red of the normal mucosa is changed to a bright red, and the hyperemic mucous membrane changes to a dark red color.

The epithelial covering is more brilliant than normally, and in the most prominent parts of the swollen longitudinal fold, and in parts of predilection may be seen a slight scaling of the epithelium or a superficial degeneration. These spots are lusterless and bleed easily.

The crypts of Morgagni appear as pinhead projections, whose color varies from red to deep red, depending on the acuteness of the infiltration. The excretory duct either is wide open with a crater-like opening and swollen, overhanging edges, and a more or less purulent secretion discharging from its lumen, or the latter is closed and the crypts then project more prominently.

The glands of Littre are affected little or not at all in this group of infiltrations. If they are prominent, the case must be relegated to the group of hard infiltrations. Most of the urethroscopic changes occur in the longitudinal folds and striæ, and can be observed best at the borderline between the diseased and the healthy area. When there is pronounced swelling, the striæ disappear,

while when the swelling is a slight one, the striæ are more pronounced than in health.

The longitudinal folds change their order and each fold is thicker than normal. There are only about half as many folds as are seen in the normal urethra; that is, three to four. The color of these folds is a deep red, and the appearance of the tissue conveys the impression of sponginess, and a smooth surface. In a urethra which normally contains but few folds, the folds may be obliterated entirely. The central field is always closed.

The clinical picture just drawn can be seen in cases of average severity in from six to eight weeks after the appearance of the first symptoms of an infection. It happens quite frequently, too, that widespread, apparently soft infiltrations have for their nucleus a small mass of hard infiltration, which shows on the surface and betrays the true nature of the affection after the surrounding soft infiltrations have been absorbed as the result of two or three dilatations done for therapeutic purposes. Oberlaender calls these mixed infiltrations. They belong to the infiltrations of the second group.

Soft infiltrations of the posterior urethra are produced by urinary sediments (uric acid, phosphates), by sexual excesses, and usually by masturbation. They also accompany tuberculosis of the genital tract and atony of the bladder, with residual urine. But the most common cause of this condition is gonorrhea. If any remains of the gonorrheal infection are found in the anterior urethra, there can be no doubt about the nature of the affection in the posterior urethra.

The examination of the posterior urethra may be omitted in cases of suspected tuberculosis and in senile hypertrophy of the prostate gland. In inflammations produced by urinary sediments, the tissues around the internal sphincter and the prostatic urethra are especially affected, while in inflammations produced by the gonorrheal infection, the process spreads more or less evenly over the entire posterior urethra, although the membranous portion, as the portal of entrance of infection, is affected more severely. If there exist reasons for believing that the inflammation is the result of excesses, the *colliculus seminalis* should be examined very carefully. Under these conditions the membranous urethra remains normal. In soft infiltrations the color of the mucous membrane is a deep red to blue red. The epithelial surface is faintly glistening. The external orifice is a dark red to red-brown, and its borders are swollen, uneven, even nodular. The colliculus is prominent throughout its whole length, and in large specimens it is possible to recognize distinct nodules and furrows. The openings of the sexual glands, the prostatic and ejaculatory ducts and the sinus pocularis have gaping mouths and swollen lips. In these cases the point of the urethroscopic tube should be held as much as possible toward the upper wall, while the tube is introduced, and as soon as the point meets with an obstruction, it should be withdrawn a little and lifted over the colliculus. Such conditions as fullness of the rectum or slight spasm of the sphincter urethræ will make it difficult to pass this obstruction, and therefore

no effort should be made to complete the examination in one sitting.

The soft infiltrations in the posterior urethra bleed very easily, but they also heal very quickly in many instances. This is seen particularly in the case of the pure gonorrheal infections, where in the course of a few weeks complete restitution may take place. In the case of the soft infiltrations that are caused by urinary sediments, the healing is dependent entirely on the condition of the urinary tract. In the urethritis due to excesses, the return to the normal of the *colliculus seminalis* does not take place so soon, because, as a rule, the habits that have caused the condition are persisted in.

The *pars membranacea* is the first to regain its normal appearance, and the *pars prostatica* comes next. The colliculus improves quickly at first, and regains its normal appearance to a certain extent, but it is congested for a long time. This is true, especially, when a chronic prostatitis or an inflammation of the seminal passages coexists. How and when a relapse takes place must be judged from the etiologic and clinical conditions. The slightest vestige of a gonorrheal infection in the anterior urethra may at any time cause a relapse of the condition in the posterior urethra.

The length of time in which a soft infiltration can be produced also is dependent on the etiologic factors operative in the case. Gonorrheal infiltrations often appear within a few weeks or days, and under certain conditions they disappear just as quickly. The chronic

irritation of the mucous membrane that is due to the urinary sediments does not manifest itself for several months; whereas the infiltration of the *colliculus seminalis* due to excesses follows after years of intense irritation. In these cases the retrogressive changes occur much more slowly than in the cases caused by gonorrhea.

HARD INFILTRATIONS.

The characteristic feature of this group of inflammations is their persistence. This is due to the excessive production of connective tissue in what otherwise are cellular infiltrations. This feature is not so noticeable in the hard infiltrations of the first degree as it is in those of the second and third degrees. The latter are perceptible to the fingers as soon as the urethroscopic tube is introduced.

The central field is more or less gaping. The inflammatory patches are distributed irregularly, both on the surface of the membrane and in the depths of the urethral tissue. The favorite location of the hard infiltration is the middle portion of the pendulous and all of the bulbous urethra.

Another objective symptom manifested by all degrees of hard infiltrations is the "transient scar."

Hard Infiltrations of the First Degree.—This is the first group in which the glandular infection is prominent, and for the sake of clearness it is necessary to describe these infiltrations under separate heads.

a. The glandular or moist inflammation shows the mouth of the diseased excretory duct of Littre's gland

raised above the surface of the mucous membrane. The longitudinal striæ are absent in all of these urethras, and the longitudinal folds are absent in the narrow and anemic urethras. In the large and capacious urethras, where the folds are numerous, these lesions cause a diminution in the number of longitudinal folds as well as a change in their size and shape. Instead of there being from eight to twelve small, smooth folds, the funnel shows only about four to six coarse folds. The color of the affected area is paler than that of the healthy parts. This is a pathognomonic sign, one that is distinctly marked at the borderline of the healthy and the diseased mucosa. The color changes from a healthy-looking pale red to a very light gray, and from a healthy-looking deep red to an unhealthy-looking pale red.

At the height of the inflammation the epithelium is desquamating, the process being most pronounced in the most infiltrated parts, and in the neighborhood of the affected excretory ducts of the glands. Opalescent spots of pachydermia are often found. The surface in general is slightly glistening. The crypts of Morgagni appear as small red projections, and the glands of Littre are recognized by the vividly colored borders of their excretory ducts. They occupy the center of the infiltrated patches. During the process of absorption or retrogressive healing the striæ may reappear. The longitudinal folds of the wide urethras show a division, but the new folds are short, their course is interrupted by unabsorbed patches of infiltra-

tion, or the latter may divert the folds from their longitudinal course, often to such an extent as to bring them at right angles to the long axis of the urethra. Narrow and anemic urethras show the same changes as do the wider ones, but the changes are not so distinctive.

The changes in the epithelial covering furnish the best guides on which to base an opinion as to the stage of absorption. The opalescent nests of pachydermia disappear first, next the desquamation ceases, and, finally, the faint glistening appearance of the cells gives way to the brilliancy seen in a normal urethra.

Small stellate scars, or scars circular in outline, are usually seen in the surrounding glands, but they rarely persist to the stage of complete healing, because they are still interpersed with numerous nests of cellular elements, and therefore cannot resist absorption. The retrogressive healing always is irregular on account of the patchy character of the affection. The crypts and glands lose their red color and regain their usual appearance, but disappear either by atrophy or they are covered over with a layer of scar tissue.

b. The follicular or dry infiltrations do not cause the excretory ducts to project on the surface of the mucous membrane. The affection of the glands is hidden from view. The dry infiltrations are found in cases which have not been subjected to instrumental treatment. The longitudinal striæ disappear and the longitudinal folds are obliterated, even in wide urethras. The color of the mucous membrane varies according to the blood supply from a pale rose to a yellow-gray.

Anemic membranes have a waxy appearance. The color is more uniform than in the case of the glandular infiltrations.

The epithelium is in an advanced stage of desquamation, especially at the height of the affection. In the urethras, which have not been cocainized, large amounts can sometimes be found. Oberlaender has given to this form the name of *urethritis sicca proliferans*. During the process of healing both the longitudinal striæ and folds are slower to return than in the glandular infiltrations. The masses of infiltrations are larger than in the glandular variety. Hence, more time is required for their absorption, and as the healthy normal color appears only after complete absorption has taken place, the urethra does not resume its normal appearance for a long time.

The desquamation of the epithelium soon yields to the dilatation, but the faint luster and the unevenness of the surface remain for some time. Great attention should be paid to the appearance of the epithelium, and the case must not be considered as cured until there is a uniformly brilliant surface of the mucous membrane. The onset of a relapse is manifested by the loss of brilliancy which appears some time before any clinical evidence is detected.

Connective tissue is found in small bundles surrounding the glands and crypts, and on account of its greater bulk it is more persistent in this than in the glandular form. Graduated dilatation treatment dissolves the covering of the glands, and the excretory ducts appear

on the surface. In some cases the dilatation stimulates the secretion of the still covered glands, the covering of the excretory duct is pushed into the lumen of the urethra, and appears in the urethroscope as a transparent vesicle of pinhead size which breaks and disappears after a while. The subsequent retrogressive healing is the same as described in the glandular form.

Hard infiltrations of the first degree may be found from several months to one year after the infection has occurred. Discharge of pus from the external meatus or the presence of filaments in the urine may or may not occur in these cases.

Hard Infiltrations of the Second Degree.—This stage of gonorrhea includes the largest number of cases of chronic gonorrhea. The urethroscopic findings are identical with those of the first degree, but they are more marked.

a. In the glandular or moist infiltrations the longitudinal striæ are absent. The longitudinal folds are obliterated even in the wide urethras, except at the borderline of the patches. In some cases no attempt at the production of a funnel can be seen. The urethra has the appearance of a stiff tube in a portion of its extent, but after passing the narrowest portion of the urethra, the urethroscope moves with ease, and some attempts at the production of folds are noted. These folds generally occur irregularly and may take a transverse direction. Then there may be seen folds arranged regularly but coarse in form.

The color is paler than in the infiltrations of the

first degree on account of the greater bulk of the deposited masses of connective tissue. The epithelium shows all stages of change, depending on the nature of the affection in the underlying mucosa.

The crypts and glands are affected in the same way as they are in the infiltrations of the first degree, but there is more connective tissue formation in and around the affected structures. The mucosa itself shows scars of varying size, usually presenting a net-like arrangement. Here and there may be seen patches of granulation.

More time is required by the process of healing in this stage than in the infiltrations of the first degree. Its appearance is manifested by the reappearance of the longitudinal folds, and the gradual return of the normal color and the uniform brilliancy of the epithelium. All the changes which appear here have been described under the infiltrations of the first degree, but the connective tissue is produced in larger masses of greater density, and is therefore more resistant against absorption. Besides, its deposition is not limited to the surroundings of the glands, but is found throughout the mucous membrane.

b. The follicular or dry infiltrations. The urethroscopic picture fails to reveal folds and striæ. The color of the tissues varies from a uniform yellowish-red to a grayish-red. In the non-cocainized urethra through which no urine has passed for some time, there are often found loose, thick, brittle masses of epithelium. Glands and crypts are seldom seen on the surface. The

healing of the patches is irregular. The two spots which are the slowest to heal are the posterior portion of the pendulous urethra on the sides towards the *corpora cavernosa*, and in all of the bulbous sac. In both these places the infiltration extends, sometimes away into the erectile tissues.

After the patient has been receiving instrumental treatment for some time, the urethroscopic picture may appear to be a normal one, when on further dilatation a deeply located area of infiltration is acted on and the result is a relapse. Relapses, therefore, are not only unavoidable, but they are the natural result of the rational treatment of any form of chronic gonorrhea in which the deeper parts of the tissues are involved. The relapse can be detected by means of the urethroscope before any clinical evidence is manifested. The epithelial surface loses its luster, it is pale, and the longitudinal striæ and folds disappear. When the relapse occurs in the pendulous urethra, the upper half of the funnel is obliterated by the mucosa being stretched straight across the opening of the urethroscopic tube.

At least three or four months are required for the development of a case of hard infiltration of the second degree, but if left alone after once it is started, its progression is practically without any limit. The lesion may still be increasing after the lapse of years, and in some cases it may be increased in severity by unsuitable instrumental treatment. During all this time there may be no secretion coming from the meatus or threads appearing in the urine. There is no definite

rule about this, but the infective nature of the case remains undiminished. The narrowing of the anterior urethra which is produced by these changes does not necessarily cause any disturbance in the voiding of the urine. This latter depends more particularly on the degree of affection of the posterior urethra and the prostate.

Hard Infiltrations of the Third Degree.—These infiltrations correspond to what is known clinically as a stricture. A urethroscopic examination can be made in these cases as soon as a bougie of No. 23 Charrière will pass the stricture. The tube of 21 Charrière will then pass easily. It will reveal the exact position, the number and the general conditions of the infiltrations present. Sometimes the tube enters to just about the middle of the strongest infiltration, when its farther introduction is made impossible by the presence of a compact mass of infiltrated tissue stretching across the lumen of the urethra. After a few more attempts at dilatation, the obstruction usually can be passed.

The urethroscopic picture of these infiltrations does not differ from that presented by the hard infiltrations of the second degree. As a rule, from three to four months or even several years must elapse before the formation of the stricture. In the pendulous urethra the infiltrations are always more extensive than is at first apparent. The entire anterior urethra, beginning behind the glans penis and ending with the bulb, usually is affected. The greatest narrowing is found about midway between the glans and the bulb.

The striæ and the folds are affected as in the infiltrations of lesser degree. The tissue is pale and it has a patchy distribution in the glandular areas, is very pale, and spread uniformly in the follicular form. The epithelium exhibits all degrees of changes from a slightly changed luster to a pachydermic appearance. The funnel is either absent entirely or its central field is disfigured. The examining tube must be withdrawn very slowly because the narrowing parts slip quickly from under the tube. The scars may not be seen to their full extent in the first examination. The urethroscopic picture therefore changes continuously during the course of the treatment.

Folds gradually begin to appear, at first short and coarse, and interrupted by the remaining hard infiltration. More time is required for the absorption of the dry form of stricture than for the absorption of the glandular form, because the masses of connective tissue are of greater bulk.

Before a case of stricture is ready to be discharged, the following endoscopic conditions must be present. The largest urethroscopic tube which will easily pass the meatus should meet with no resistance in the anterior urethra. The largest part of the cavernous portion of the urethra should show normal folds, and the mucous membrane at the site of the stricture should appear loose. The circulation must be good, imparting a fresh color to the mucosa. It is not possible to restore to the epithelium its normal brilliancy in every case, but it should not have the appearance either of dryness

or scaliness. The scars should appear as clean whitish streaks or points located subepithelially, and should not show any sloughing. The tissue around the glands should not show any evidence of irritation.

Relapses are the rule, and not the exception in these cases. They usually appear within the area of the old affection. But this is not always the case, especially in recent infections, those not over one year old. The new swollen part may be in front of or behind the location of the old infiltration. The urethroscopic picture of the relapse varies. It may have the appearance of a picture seen at the beginning of the first dilatation, or that seen during the last third or quarter of the period of healing.

The hard infiltrations of the posterior urethra resemble those of the anterior urethra, but they do not show as great a variation. The membranous portion histologically stands nearer to the anterior urethra than does the prostatic portion, and pathologic changes seen here therefore resemble more those met with in the anterior urethra than in the remainder of the posterior urethra.

Gonorrhea is the most frequent etiologic factor in the production of hard infiltrations, but sexual excesses, mostly masturbation, may produce a hard infiltration of the *colliculus seminalis* and of the excretory ducts of the sexual glands, one which resembles very much the infiltration caused by gonorrhea.

The division of the hard infiltration into a glandular and a follicular form is not as marked here as in the an-

terior urethra. In the hard infiltrations of the first degree the membranous urethra is pale red, and has a dead, glistening surface. The colliculus is lower than normal, and has a pale yellow or greenish-white color, a distinctly dry look, and not showing any furrows. The openings of the sexual glands are small, not gaping, and have only a slightly reddened border.

In the hard infiltrations of the second degree it is always necessary to dilate for some time before a successful urethroscopic examination can be made of the posterior urethra. If a sound of No. 25 Charrière enters the bladder, a successful examination can be made with tube 0, No. 23 Charrière. The urethroscope reveals the same picture as is seen in the case of infiltrations of the same degree in the anterior urethra. A long course of dilatation may be necessary in the case of these hard infiltrations before a successful endoscopic examination can be made. After entering the posterior urethra, the tube often is obstructed by infiltrations deposited around the tube circularly. The urethroscopic picture is identical with that seen in the anterior urethra. In some cases the newly-formed tissue is one with the surrounding tissue. The lumen of the urethra is distorted, thus preventing a satisfactory urethroscopic examination.

As to the healing, the same holds true here as in the case of the same affection in the anterior urethra. The scars gradually separate into smaller linear ones. The surface regains its luster and there may be some attempts made at the formation of a funnel. The collic-

ulus usually retains its flat and depressed form. Relapses are the rule in most cases.

The time necessary for the production of hard infiltrations in the posterior urethra varies considerably. Infiltrations of the colliculus without gonorrheal infection may not occur until after years of continued excessive sexual irritation. Hard infiltrations of slight degree and due to gonorrheal infection may be expected to form within a year from the occurrence of the infection. At least several years are required for the formation of a stricture.

In some instances the gonorrheal infection of the posterior urethra is accompanied by the formation of abscesses. Oberlaender describes inflammations under a separate heading. He has found that these abscesses occur only in the cases of mixed infection, when the condition of the mucous membrane is bad, and in certain individuals who possess a natural predisposition to chronic catarrhs and to tuberculosis. Oberlaender's investigations on the cadaver show that abscess formation very often occurs in persons who are affected with phthisis, but who do not show any tubercular lesions in the genitourinary tract.

A urethroscopic examination is seldom possible during the formation of abscesses, because of their acute course. The clinical symptoms are those of a more or less painful posterior gonorrheal urethritis of long standing.

The sequelæ of this affection are scarry strictures; there is no narrowing of the anterior urethra nor of the

remaining portion of the posterior urethra. With the exercise of patience, it is possible to restore the lumen of the urethra to its natural size and form. The urethroscope shows linear and star-shaped scars.

All affections of the posterior urethra often are accompanied by similar affections of the seminal vesicles and the prostate gland, but the severity of these lesions is not interdependent. A common soft infiltration which yields readily to suitable treatment may be accompanied by a very obstinate funiculitis or prostatitis, and *vice versa*.

As to the location of the disease, it may be said that, as a rule, the entire posterior urethra is affected, but not in the same degree in all its parts. A hard infiltration of the membranous urethra may be accompanied by a soft infiltration in other parts of the posterior urethra.

THE CHANGES OF THE EPITHELIUM.

The changes in the epithelial covering are important, from the standpoint of diagnosis. It is therefore necessary as well as advisable to discuss them separately. Normally, the epithelium is smooth and moist, transparent, and of a uniform color. Its natural brilliancy may be enhanced by the presence of mucus, remains of glycerine and cocaine, and also pathologically, when there are present slight forms of soft infiltrations.

Diseased conditions as a rule do not increase its brilliancy; on the contrary, they cause it to disappear. Long-standing irritations produce disturbances in the nutrition of the epithelial covering which lead either to its complete destruction or to its degeneration into pavement

epithelium. In slight forms of infiltrations the diseased membrane assumes a lusterless appearance, although its surface remains smooth. In an anemic mucous membrane, slight disturbances in nutrition may not be noticed. The color is normal, but capillary networks may develop in the longitudinal folds. These networks are observed through the urethroscope as small elevations usually denuded of epithelium. Then, too, small areas of granulation bleed easily if they are touched with the tube during the examination.

In the hard infiltrations of the mucous membrane, the disturbance of nutrition is more marked than in the soft infiltrations. The epithelium loses its translucent appearance and its surface is less smooth than normally, due to the desquamation and irregular reproduction of the cell layers. A careful urethroscopic examination reveals quite a number of small irregular elevations, which rarely ever bleed.

As the process continues, the desquamation is accompanied by an overgrowth of epithelium in the most diseased spots; the elevations now measure one or more millimeters in height, and bleed easily. The surface of the affected part shows a loss of substance. A continuance of the process may cause spots of pachydermic change in the epithelium, or this change may be uniform throughout. The epithelium has a pale grayish color; its surface is irregular, and shining through it, here and there, may be seen the red color of the underlying mucosa. This imparts to the mucous membrane an appearance like that of being covered by a veil.

In cases treated by injections, Oberlaender found that when zinc salts come in contact with the mucous membrane while it is in the stage of soft infiltration, small white crusts may be produced, and these remain for several weeks after stopping the use of the zinc salt. So, too, resorcin, in strong solution, may cause great swelling and cornification of the epithelium, similar to the effect seen in the skin after applying a strong solution to it. Silver nitrate used for a short time imparts to the mucous membrane an even, whitish look, as though it were covered with white crust. The shaving off of these crusts may take place within a few hours or days after the last treatment. The continued use of the silver produces the condition known as argyrosis, staining the mucous membrane as it does the skin. The discoloration appears in the form of bluish-black spots, which are found mostly in the bulb and in the neighboring parts of the shaft. They seem to follow the longitudinal fold. The discoloration is most apparent in mucous membranes rich in blood supply. Dark discolored rings are often found surrounding inflamed glands and crypts. This is caused by the staining of the epithelial overgrowth in these tissues. The argyrosis of the urethral mucous membrane may persist for years without apparently interfering in any way with the well-being of the patient.

A pure epithelial abnormality is *psoriasis mucosæ* (Oberlaender). This condition, occurring either with or without the incentive of a chronic gonorrhea, consists of irregular, semi-circular or spherical white spots. These

spots are very thin and transparent in the center, but become more dense at the periphery. They do not project above the surface of the mucous membrane. They are not due to proliferation of tissue. Their etiology is not definitely known. Kollmann showed that the epithelium covering these spots was of the pavement variety.

CHAPTER V.

PROGNOSIS OF ACUTE AND CHRONIC GONORRHEA.

In pure gonorrheal affections of the urethra, the prognosis is good. In the subacute and chronic cases the prognosis depends on the nature of the infiltrations, the duration of the case, the severity of the complications, and the treatment instituted. Illy-conducted instrumental treatment may retard the healing for a long time. The age of the patient is of no significance, but the duration of the disease plays an important part in the retrogressive process of healing. A case of only three or four years' standing will give a better prognosis, so far as complete healing is concerned, than one of longer duration, ten to twenty years. In the latter case, a very careful diagnosis must be made and the reactions following the treatments must be noted with precision. An opinion as to the duration of the treatment necessary should be expressed with reserve.

On the other hand, it is wrong to make a bad prognosis, even in the case of old and apparently stubborn cases without having first made every possible attempt to produce a cure. In cases that have been overtreated, it is advisable to stop the use of instruments and to keep the patient on internal medication (balsamics, urotropin) for several months.

No method of treatment will prevent the occurrence

of relapses. They are determined by the pathology of the condition, and consequently form a regular part of the treatment. Our method enables us to see the objective evidences before any clinical symptoms are manifested. Suitable treatment can, therefore, be instituted early and the severity of the relapse diminished.

It is difficult to estimate the length of time required for treatment in any case, but there are certain points which can be determined by urethroscopic examination and by means of which we may guard against making any gross errors. The soft infiltrations seen in the subacute cases and in the healing stage in the acute cases offer the best prognosis. These cases usually heal within three to six weeks. In the hard infiltrations, even those of slight degree, the prognosis is less certain and less favorable. This stage of chronic gonorrhea requires longer treatment, and is more often accompanied by complications. As a rule, the treatment must be continued for as many weeks as the disease has existed months. In the case of the infiltrations of the worst degree, no prediction should be made as to the possible duration of the treatment until the case has been under observation for some time and has shown a tendency to decided and steady inprovement. This must be verified by urethroscopic examination. The lessening and cessation of the secretion, the disappearance of filaments from the urine, and the amelioration of the subjective symptoms and signs are taken by the patient and by the inexperienced physician to mean the beginning of the healing process. Provided that the

urethroscopic examination shows the process of healing to be a satisfactory one, we can tell the patient that one-half to three-fourths of the time that has passed since the last infection will elapse before a cure may take place.

Other factors which have a disturbing influence on the process of healing are a poor condition of the mucous membrane, chronic catarrhal inflammations in other parts of the body, alcoholism, bicycling, impure sexual intercourse, complications and mixed infections. In certain conditions it is advisable to confine one's self to symptomatic treatment, or no treatment at all, as, for instance, in cases of heart disease, progressive tuberculosis of the lung, grave luetic affections, especially lues of the nervous system, severe forms of diabetes, and of neurasthenia (not sexual neurasthenia), diseases of the kidneys if there does not exist a causal relationship between the kidney affection and the chronic gonorrhea.

The pronounced clinical symptoms of a gonorrheal complication usually begin and end with the acute stage. It is of the greatest importance, however, first to treat the underlying condition, although any active treatment of the gonorrhea itself will increase the severity of the complication.

The course to be pursued in these cases depends in great part on the experience and skill of the physician.

Of substances whose ingestion should be avoided, the following may be named: Alcohol and some fermented, non-alcoholic substances contained in recently

brewed beer and in wines, spices, such as pepper, onions and the so-called English sauces. Recent observations seem to show that the above-named substances reduce the opsonic index and injure the patient more by reducing his resistance than by the production of an irritating urine. Coitus should be prohibited absolutely, although some clinicians permit its occasional practice when a condom is used.

CHAPTER VI.

INSTRUMENTS USED IN THE TREATMENT OF GONORRHEAL INFILTRATIONS.

For the sake of thoroughness and a better understanding of the instrumental treatment of gonorrhea, it is well to describe the instruments employed before the treatment itself is taken up. These instruments may be of metallic construction, when they are non-elastic, or of non-metallic construction, when they are elastic. The metallic instruments consist of catheters, sounds and dilators.

A very important part of every instrument is its curve. Therefore, we will describe briefly the most important curves employed.

Dittel recommends three curves, the short, the middle and the long. The short curve (Fig. 13) represents the segment of a circle 9 centimeters in diameter. The point of the curve ends 30 millimeters from the elongation of the longitudinal axis. The middle curve (Fig. 14) represents the segment of a circle, 10.8 centimeters in diameter, the point of the curve ending 40 millimeters from the elongation of the longitudinal axis. The long curve (Fig. 15) represents the segment of a circle, 13.8 centimeters in diameter, and its point ends 58 centimeters from the elongation of the longitudinal axis. In the Guyon-Thompson stone searcher (Fig. 16)

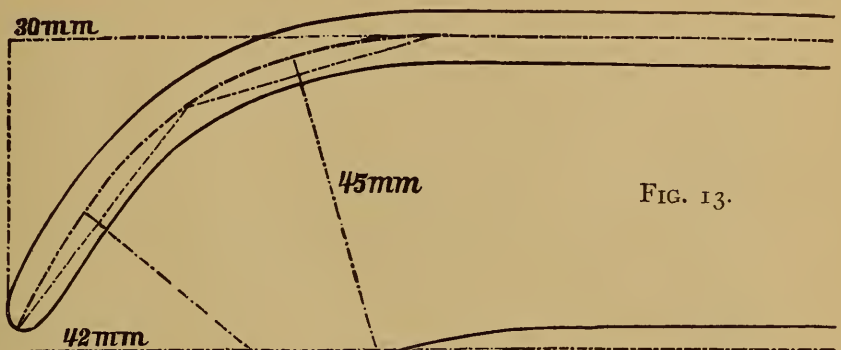

FIG. 13.

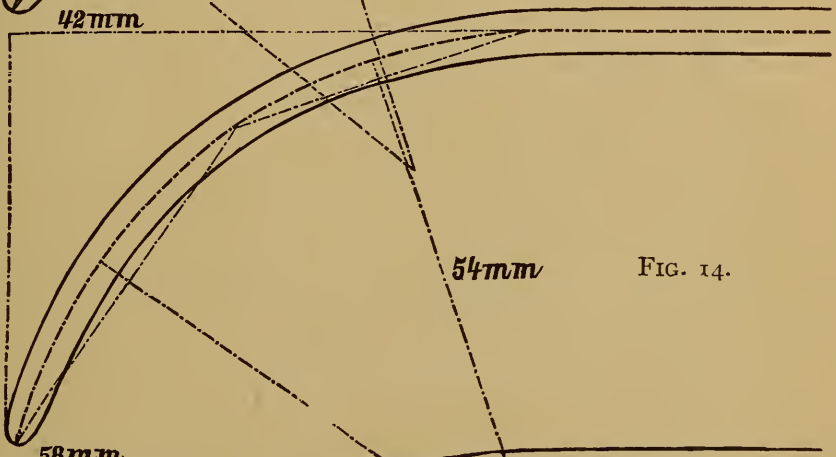

FIG. 14.

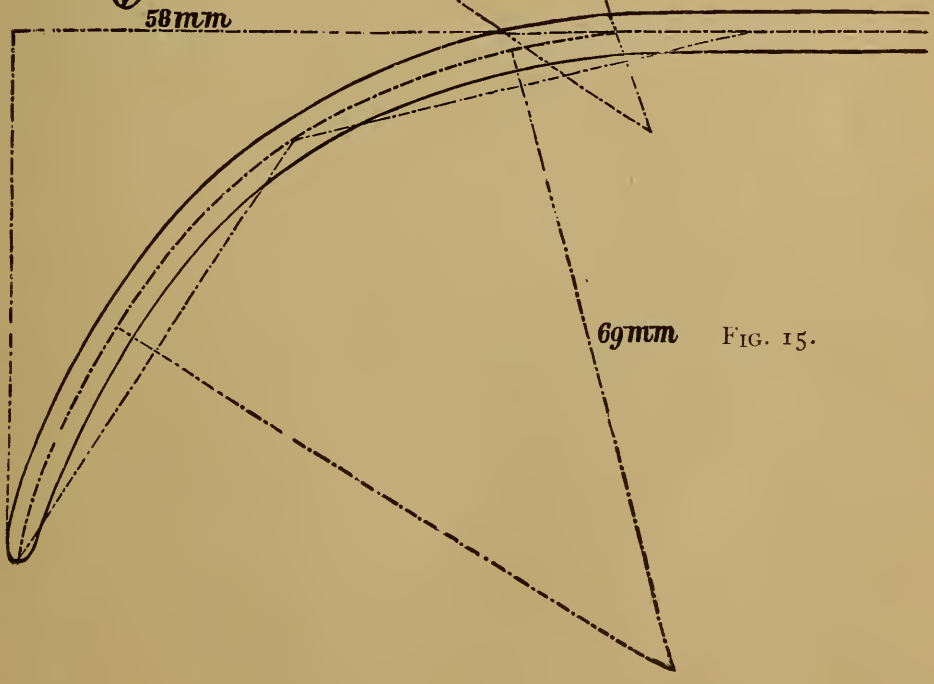

FIG. 15.

the curve is knee-shaped or in the form of a hook. This instrument is particularly useful in those cases where instruments having the ordinary curve can be made to enter the posterior urethra with difficulty. In the majority of cases it does not matter which instrument is used, but the most convenient is that having a short curve and representing one-fourth of the segment of the circle. It is advisable, however, to have on hand the variously-curved instruments.

Fig. 16. Guyon-Thompson stone-searcher.

The metallic catheters ought to be made of hard silver, but if expense is an item, the instruments can be made of German silver nickel-plated.

The catheter should not be less than 28 to 30 centimeters (11 to 12 inches) long. Dittel recommends the use of 14 Charrière catheters for dilating strictures rather than the sounds, because the former are lighter in weight and less prone to injure the urethra than the solid instruments.

Some metallic catheters are made exclusively for irrigating purposes, such as the irrigating catheters of Oberlaender, of which there are two forms (Figs. 17 and 18), both of which are used in the anterior urethra only. The former consists of a silver tube, 15 cms. (6 inches) long, having a slight bend at its distal end, in which are seen several rows of small perforations. It is

manufactured in sizes of 14 to 20 Charrière; the latter is a straight tube, 15 cms. long, and about 15 Charrière size. Its distal end is provided with a thread for the purpose of attaching a head corresponding to the size

Fig. 17.

of the urethra or the caliber of the meatus. These heads range in size from 18 to 24 Charriére. In the tube below the head are several rows of perforations through which the irrigating fluid passes.

Fig. 18.

An instrument used extensively for irrigating the posterior urethra is the curved injector of Ultzmann, modified by Oberlaender (Fig. 19). It consists of a metal tube, 20 cms. (8 inches) long, and 15 Charrière in

Fig. 19.—Oberlaender-Ultzmann injector.

diameter. The distal end of this tube is provided with numerous small perforations, which facilitate the application of medicaments.

The instillator (Fig. 20) also was devised by Ultz-

mann. It consists of a capillary catheter to which is attached a small syringe. It is used for the purpose of depositing small quantities of strong nitrate of silver solution on the urethral mucous membrane. The instrument should not be used because, first, this method of

Fig. 20.—Ultzmann instillator.

treatment is irrational so far as the pathology of gonorrheal infiltrations is concerned, and, second, the applications can be made far more satisfactorily by means of a Guyon perforated explorator (Fig. 21).

The straight metal sounds are used exclusively for

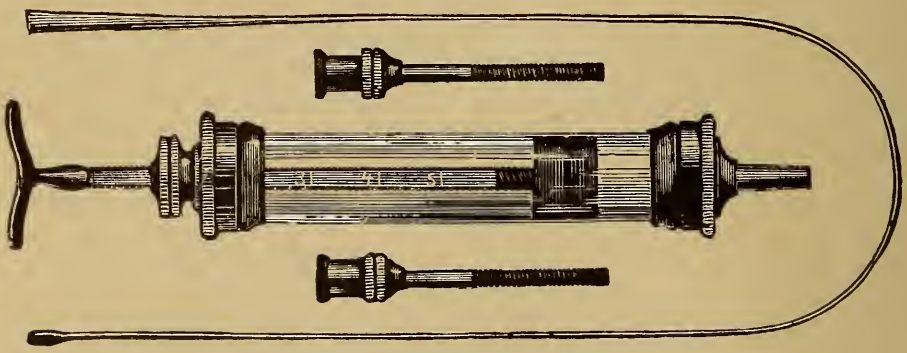

Fig. 21.—Guyon perforated explorateur.

the treatment of the anterior urethra, while the curved sounds are used for the treatment of the posterior urethra and for examination of the bladder. The straight sounds (Fig. 22) used by Oberlaender and Kollmann are somewhat conical in shape, the difference between

the largest and the smallest part averaging two Charrière. The shaft is 15 cms. (6 inches) long. The handle consists of a metal plate on which is stamped the size of the instrument. The largest part of the sound designates its size.

FIG. 22.—Sound for anterior urethra.

FIG. 23.—Sound with short Dittel curve.

FIG. 24.—Sound with long Dittel curve.

FIG. 25.—Sound with Guyon curve.

The curved sounds are also slightly conical, the difference between the smallest and the largest diameter averaging two to three numbers of Charrière. The sounds used most often are shown in Figs. 23 and 24.

A sound of special value in cases of hypertrophy of the prostate, on account of the pressure it exerts on the colliculus seminalis and on the ends of the prostatic and ejaculatory ducts, is Guyon's modification of Béniqué's sound (Fig. 25). The curve of this sound,

as manufactured to-day, represents one-third of the circumference of the circle measuring 9.2 cms. ($3\frac{3}{4}$ inches) in diameter. It is cylindrical in shape, and from 28 to 30 cms. (11 to 12 inches) long. Of the metal sounds, both the straight and the curved, the physician should be supplied with all the numbers from 15 to 30 Charrière. The best material for manufacturing these instruments is German silver nickel-plated. The steel sounds ordinarily supplied by instrument-makers are not so expensive as the German silver sounds, but they possess the disadvantage that they corrode very easily and lose their smoothness.

The dilators are metallic instruments which can be introduced into the urethra in a closed condition. They measure 21 to 25 Charrière, and may be dilated up to 45 Charrière, as needed. The dilators take the place of the sounds in the treatment of gonorrheal infiltrations of slight degree that are situated in those parts of the urethra that have a larger caliber than the external orifice. A sound effectually dilates the narrowest part of the urethra, and is therefore of service only in the beginning of the treatment, for the purpose of improving the strongest infiltrations and absorbing or healing infiltrations situated in narrow parts of the urethra, especially around the meatus. For this and for other reasons to be mentioned later, it is always advisable to begin the treatment by using sounds, changing to the dilators when the urethroscopic picture shows that the period of usefulness of the sounds is passed.

Kollmann advises the use of straight sounds up to 30

Charrière before changing to dilators. Otis, of New York, was the first to use dilators in the treatment of chronic gonorrhea. While his views on the pathology and the treatment of this affection are open to question, he was the first to take a step in the right direction and must, therefore, be regarded as the father of the present-day therapeutics of chronic gonorrhea.

Otis devised a two-branch dilator (Fig. 26) which could also be used as a urethrotome. It is with this instrument that Oberlaender made his first studies, and that led to the construction of a modified two-branch dilator, to be used in the anterior urethra. Oberlaender then devised instruments of different forms designed to be used in every part of the urethra.

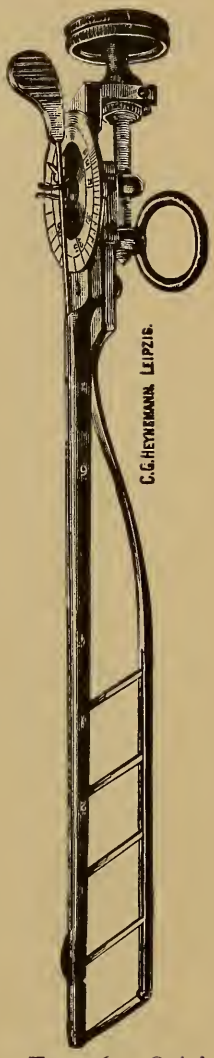

FIG. 26.—Otis' two branch dilator and urethrotome.

The mechanical action of the sounds consists of tension and pressure. The therapeutic action of the dilators consists of tension between the branches and pressure with some tension over the branches. It is evident that the more branches a dilator possesses, the more nearly will its therapeutic effects resemble those of the sounds. Kollmann's four-branch dilator meets these requirements the best.

At least three varieties of Kollmann's dilators are

FIG. 27.—Dilator for the anterior urethra.

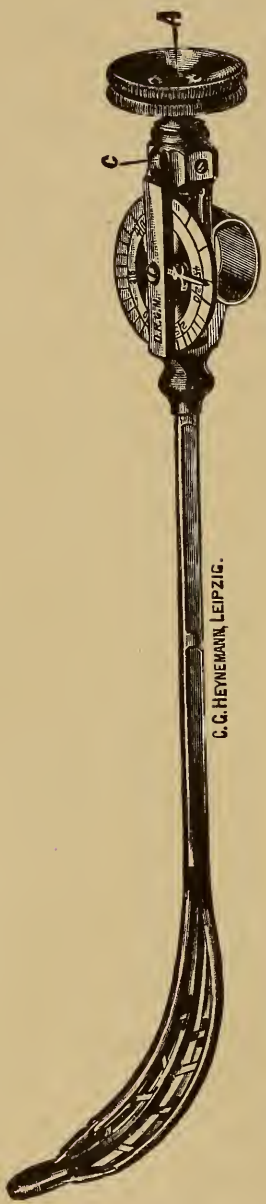

FIG. 28.—Dilator for the posterior urethra and the bulb. (*Dittel's curve.*)

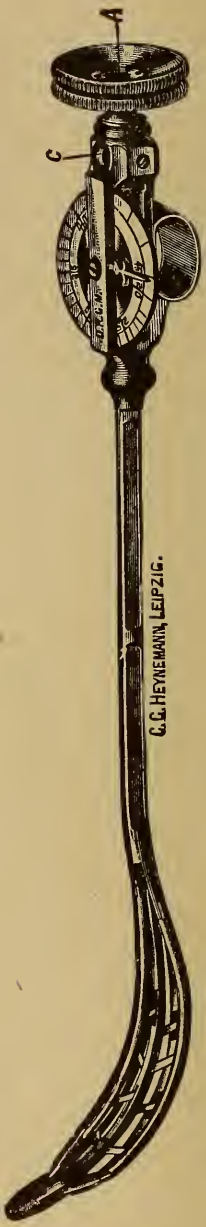

FIG. 29.—Dilator for the posterior urethra and the bulb. (*Guyon curve.*)

necessary to treat the infiltrations of the urethra rationally: 1. A straight four-branch dilator, to be used in the anterior urethra, and having a dilating surface of not less than 12 cms. (5 inches) long (Fig. 27). 2. A dilator with Dittel's or Guyon's curve, which dilates only at the curved portion (Figs. 28 and 29). The length of the dilating part of the instrument is from 9 to 10 cms. (4 inches). These dilators are of service for dilating the posterior urethra and the bulb. 3. A dilator which dilates throughout its entire length, both in its curved and in its straight parts, and which can be provided either with a Dittel or a Guyon curve. It is used to dilate the entire urethra, and in the case of long urethræ it may also be used to dilate the bulb only (Figs. 30 and 31).

Formerly it was necessary to cover the dilators with rubber caps, so that they could not injure the mucous membrane, which they were especially apt to do while the instrument is being closed. The newer forms of Kollmann's instruments can be used without a protector. Fig. 32 shows the difference between the old and the new form of construction. In transverse section the old instrument forms a circle when closed, while the new instrument shows the branches as separate bars, with intervening spaces of large size between their peripheral parts. A revolving plate at the handle of the instrument indicates the degree of dilatation.

In order to do efficient work, the operator should be supplied with at least three of Kollmann's dilators. To be limited to only two, the anterior and the poste-

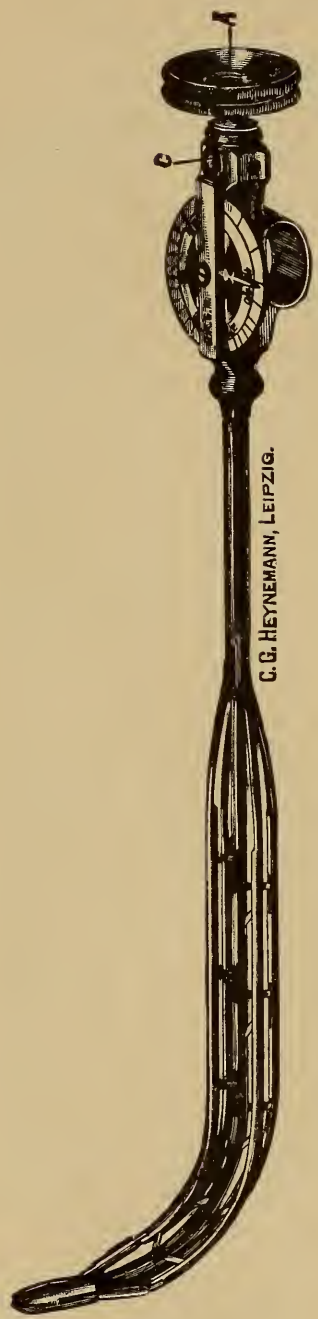

FIG. 30.—Dilator for anterior and posterior urethra. (*Dittel's curve.*)

FIG. 31.—Dilator for anterior and posterior urethra. (*Guyon's curve.*)

rior, lengthens the time of treatment. If he is limited to the use of only one dilator, he must choose the posterior, but, of course, the result of the treatment will not be very satisfactory.

For irrigating the mucous membrane while the urethra is dilated, Kollmann, following the example of Lohnstein, constructed dilators with irrigating devices. The principle of their construction is the same as that of the simple dilator, but they are hollow and serve the purpose of a dilator and irrigator. The position of the branches is somewhat different, inasmuch as the purpose which these instruments serve is not so much that of dilatation as irrigation. The dorsal

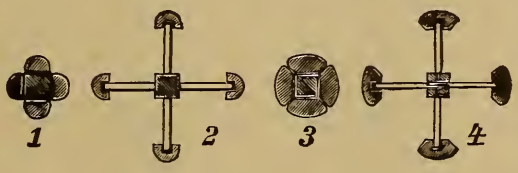

FIG. 32.

and ventral surfaces of the urethral canal must, therefore, not be covered by the dilating branches, as is done by the simple dilator. Fig. 33 shows the principal forms of Kollmann's irrigating dilators.

The elastic instruments employed in the treatment of gonorrhea are the catheters and the bougies. They are constructed of a tightly woven ground substance of cotton or silk, or a mixture of both, impregnated with a resinous substance. One of the most important of these instruments is the Mercier catheter, with single (Fig. 34) and double (Fig. 35) curve. They are of

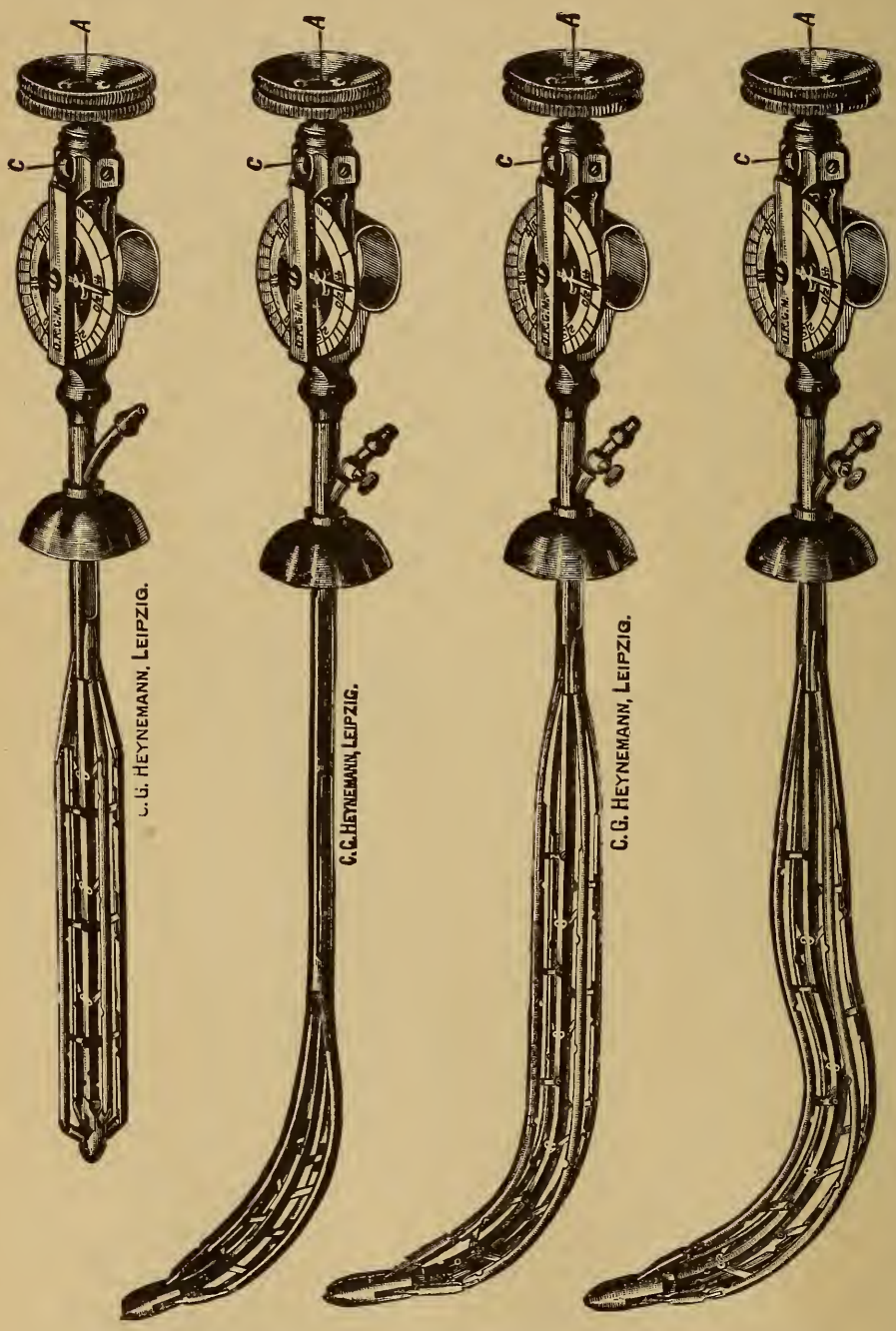

FIG. 33.—The principal forms of Kollmann's dilating irrigators.

special use in cases of prostatic hypertrophy. Guyon's perforated explorator is very well adapted for making

FIG. 34.—Mercier catheter with single curve.

FIG. 35.—Mercier catheter with double curve.

deep urethral instillations. Its lumen, which is of very small size, ends in a single opening at the extreme end of an olive-shaped head.

Of the elastic sounds or bougies, the cylindrical shaped (Fig. 36) and the conical shaped, with and with-

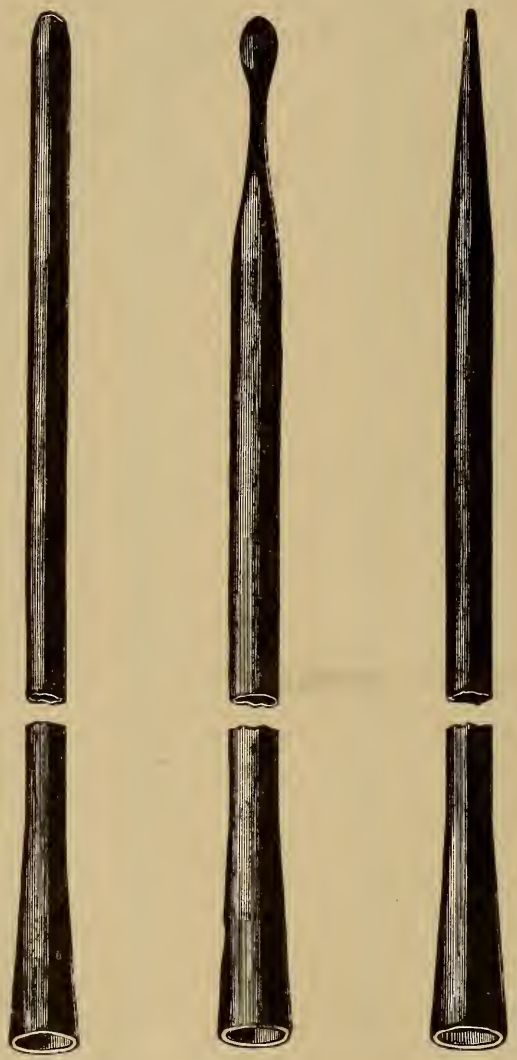

FIG. 36. FIG. 37. FIG. 38.

Fig. 36.—Cylindrical shaped bougie.
Fig. 37.—Conical shaped bougie with bulbous end.
Fig. 38.—Conical shaped bougie.

out bulbous ends (Figs. 37 and 38), are the ones most needed. In the beginning of the treatment of a narrow

stricture, it is often necessary to make use of the filiform bougie (Fig. 39).

Now, as to the measurements of the diameters of these instruments. The most widely known form of measuring is that devised by Charrière, a French instrument-maker. Each number of his scale represents one-third of a millimeter ($\frac{1}{75}$ inch) in diameter, so that No. 30 is one centimeter ($\frac{2}{5}$ inch) in diameter.

FIG. 39. — Filiform bougie.

Van Buren and Keyes are the originators of the American scale, in which each number represents a diameter of half a millimeter ($\frac{1}{50}$ inch). English measurements are not uniform. They are subject to change by author and instrument-maker.

Instruments should always be sterilized before and after using them. The best method of sterilization is boiling, but it affects elastic instruments in time; therefore, it may at times be sufficient to disinfect these instruments by immersing them in a one promille bichloride of mercury solution, or a four per cent. carbolic acid solution. The dilators stand boiling very well, but they need special care on account of the many little

joints they have, and which break easily after they become corroded.

Some authors advise keeping these instruments immersed in absolute alcohol when they are not in use, but this method is an expensive one. The following method has given me perfect satisfaction. After sterilization the dilator is dipped into absolute alcohol and is then wrapped up in a sterile towel. The dilator is then dried under an electric lamp.

CHAPTER VII.

METHOD OF INTRODUCING INSTRUMENTS INTO THE URETHRA AND BLADDER.

The normal urethra has a lumen of very uneven caliber. Its narrowest part is at the external orifice, so that the latter determines the size of the instrument that can be used. Next to the external orifice the isthmus, the beginning of the membranous urethra, is the narrowest portion; but its narrowness is not so much the cause of difficulty in entering it as is the wideness and looseness of the bulbous sac. The wide parts of the urethra present difficulties to the introduction of instruments much more often than do the narrow portions. The wide portions of the urethra are the *navicular fossa*, the *bulbous fossa*, and the *prostate sinus* (Dittel). Instruments are introduced into the urethra with the patient in the upright, the sitting or the recumbent position. The latter is to be preferred, the hips resting on an inelastic support. Before proceeding with the introduction of the instrument, it is advisable to make a rectal examination, in order to determine the size of the prostate gland, because on the length of the prostatic urethra depends the position of the bladder; that is, whether it is situated high or low in the pelvis. The internal urethral orifice may be lifted out of the true pelvis when either the bladder or rectum are

full; while the reverse condition will cause the internal orifice to descend into the pelvis. The higher the level of the internal urethral opening, the more must the handle of an inelastic instrument be depressed in order that its distal end may be made to pass into the bladder.

It is advisable to conduct the first examination without the use of cocaine, because the natural sensitiveness of the urethra furnishes a valuable clue as to when the introduction of the instrument causes pain. The introduction of a straight metallic instrument into the anterior urethra, and of elastic instruments into the urethra and bladder, usually is not accompanied by any difficulties, provided the formation of transverse folds in the mucous membrane is prevented by traction which will lengthen the urethra and straighten the transverse folds.

The three principal methods of introducing curved metal instruments into the urethra and bladder are, the "tour over the abdomen," the "great master tour," and the "half master tour."

The first mentioned is the simplest of the three (Fig. 40). The operator stands at the left of the patient and with his right hand holds the instrument parallel with the median line. The penis is held just behind the corona between the middle and ring fingers of the left hand, while the thumb and index finger separate the lips of the meatus. The instrument is introduced in the direction of the linea alba by pulling the penis over the sound, and at the same time allowing the instrument to advance under the pubic arch by its own weight

up to the commencement of the bulbous urethra. The introduction of the instrument is completed by describing the segment of a circle until the shaft of the instrument stands vertical. The distal end ought now to have entered the isthmus, but in some cases this may be prevented by the existence of a *cul de sac*. Then, the instru-

FIG. 40.

ment is withdrawn slightly, and with the left hand under the scrotum making slight upward pressure on the bulbous sac, the instrument is introduced slowly. When its shaft is at an angle of forty-five degrees to the horizontal line, the distal end of the instrument has passed under the pubic arch and is in the prostatic urethra. Further lowering of the handle and careful advancement

of the instrument until the shaft is in the horizontal plane, brings the distal end and more or less of the curve of the instrument into the bladder. When the posterior urethra is large, and the colliculus seminalis is hypertrophied, the end of the instrument may be caught at the base of this prominence. This obstruction is made evident the moment the operator attempts to depress the instrument more than forty-five degrees.

Marked bulging of the posterior wall of the prostatic urethra (Dittel's prostatic sinus), together with a well-developed sphincter muscle may be the cause of another obstruction. According to Oberlaender, the point of the sound may also be caught in the strongly developed muscle fibers of the posterior border of the trigone. These various obstructions in the posterior urethra must be overcome by withdrawing the instrument slightly and then directing its point toward the upper wall of the urethra, at the same time making pressure from below upward and forward.

In the so-called great master tour, the physician stands to the right of the patient and begins the introduction of the instrument by holding it in a horizontal position between the thighs of the patient. After the point of the instrument has entered the bulb, the handle is made to describe a spiral over the left thigh, and is brought to a vertical position. Meanwhile, the left hand presses the instrument slightly against the isthmus.

In the small master tour the physician stands to the left of the patient and commences the introduction of the instrument by holding it at a right angle to the long

axis of the body of the patient. After reaching the bulb, a spiral curve will again bring the instrument into a vertical position.

The passage through the posterior urethra is the same in the three methods. These methods may be used as described, or modified to meet the indications of an individual case. Each one of these methods has special advantages which can be made use of in difficult cases, such, for instance, as false passages, pathologic conditions limited to one or the other wall of the urethra, well-developed *panniculus adiposus*, and so forth.

Every instrument of use in the treatment of gonorrhea must be sterilized before and after it is used. As stated before, the sterilization is effected best by boiling for from five to ten minutes in water, to which a little sodium bicarbonate has been added. When glycerine is used as a lubricant, it should also be boiled before and after use. Fatty lubricants are to be used only in exceptional cases, because they are not soluble in water.

CHAPTER VIII.

GENERAL CONSIDERATIONS OF TREATMENT.

The symptoms of a gonorrheal infection of the urethra as we see them in our clinical work represent the defense of an attacked mucous membrane and not the disease per se. What we see is the physiological effort of the attacked body to defend and rebuild its integrity, but not the attacking enemy. The gonorrheal germ and its metabolic products, by their damaging irritation, attract the fighting forces of the body to the exposed area; hence, we get a congestive hyperemia accompanied by suppuration—the useful reaction of an infected lesion—swelling and edema.

Nature does its defending and healing by hyperemia. In our effort to assist nature, we must, therefore, try to increase the congestion of an inflamed part instead of attempting to relieve it, as it has been wrongly advised. It is fortunate that Nature usually finds means of turning misdirected therapeutical efforts into the right direction. As we see it, for instance in the application of a cold to relieve congestion. Here Nature is generally able to respond to the cold by an increased congestion and in this way make the interference a beneficial one.

The treatment of gonorrhea is both medical and instrumental.

MEDICAL TREATMENT.

The medical treatment consists mainly in the use of germicidal drugs given internally or applied locally.

Their theraupetic action can be divided into a direct and an indirect. The direct action is limited to the parts with which the antiseptic comes in contact, and is of purely chemical nature. The indirect action consists in the production or in the increase of an already present congestive hyperemia. The latter is the answer of the body to the irritation produced by the antiseptic action of the drug applied;* it is also Nature's means of limiting and destroying an invading germ. The germicidal drugs administered internally in a simple infection of gonorrhea are mainly balsamic in nature. Their therapeutic action is dependent on the amount of resinous acid which they contain (Weikart and H. v. Zeissl). In the human body this acid is converted into a soluble soap by combining with potassium or sodium. This soap is excreted by the kidneys and dissolved in the urine acts as an antiseptic. The aromatics contained in these balsams are devoid of any therapeutic action, except perhaps to act as stimulants to digestion. None appear in the urine.

By far the most active balsam is oil of sandalwood. The dose is from 5 to 20 minims, taken three times a day, after meals. Taking the sandalwood with the meals does not interfere with its therapeutic action. Some patients cannot take sandalwood except with

* We often expect medical, also instrumental, treatment to produce an irritation with the intent to stimulate Nature to heal.

meals. When the patient complains of loss of appetite, the use of the drug should be discontinued. Pain in the back must be regarded as a symptom of kidney irritation, even when albumin does not appear in the urine. Under such circumstances, it is advisable to discontinue the use of the drug entirely.

The resinous soap is precipitated from the urine by nitric acid, and the precipitate may be dissolved by alcohol, thus differentiating it from albumin.

A number of very useful combinations containing oil of sandalwood may be had. As a rule, they are given in the same dose as the pure oil of sandalwood, and they are not markedly inferior in therapeutic action; neither do they derange the stomach any less than the pure drug.

The following balsamic emulsion has given me good service in these cases:

℞ Copaibæ,
Tinct. cubebæ,
Spt. ætheris nitrosi, āā..... ℥ss.
Mucilage acaciæ, q. s., ad..... ℥iv.
A teaspoonful three to four times a day after meals.

In mixed infections, especially if accompanied by alkaline urine, the following urinary antiseptics are of value:

℞ Salolis, ... ℥ij.
Aspirin,..... .. ℥j.
M. et d. in dos. æq., xxiv. One four times a day.

℞ Helmitol, ... ℥ss.
Mucilage acaciæ,q. s., ad..... ℥iv.
Teaspoonful three to four times a day after meals.

℞ Tab. Urotropin, ... gr. 7½.
XV, one, t. i. d.

℞ Caps. Arhovin, ... gr. iii.
XXX; one to two, three times a day.

Internal medication is indicated particularly in cases in which there is a marked purulent discharge, but it is that part of the treatment which may be omitted.

Of greater importance than the internal administration of drugs is the local application of germicides. The principal local germicides are potassium permanganate, nitric acid, zinc sulphate, silver nitrate, protargol and argyrol. The first three are inorganic salts possessing great chemical activity. The last two, protargol and argyrol, are synthetic products, silver protein compounds.

We know that the germicidal value of mercury and silver preparations depends especially on the number of the "dissociated" ions. They unite with the protein substances of the microorganisms to form a chemical compound which is only slightly soluble. As a substance is precipitated if the product of its solubility is surpassed, so here there is a precipitation or coagulation of the surplus metal-protein compound contained in the oversaturated solution.

If it is true that argyrol and protargol do not form a precipitate on the urethral mucous membrane, then the amount of silver protein compound formed by them is within the limits of its solubility, and its chemical activity as a germicide cannot be any greater than a solution of silver nitrate diluted to the point where

precipitation with albumin no longer takes place. The only merit possessed by these preparations is that they contain a large quantity of chemically inert silver, and this is an advantage of only doubtful value. A physician who is familiar with the pathology of his cases and who is in a position to make a correct diagnosis will do better not to use these and other widely advertised preparation of a similar nature.

Water is the best ionizing solvent. A salt dissolved in equal molecular amounts in different solvents of equal volume will show more free ions in water than in any of the other solvents. The addition of alcohol, glycerine or ether to an aqueous solution of any of the silver salts will, while increasing the solibulity, decrease the amount of free ions and with it the chemical activity, the irritating qualities, and the germicidal power of the solution. A solution of nitrate of silver in absolute alcohol or ether possesses little or no germicidal power, because these solvents prevent its dissociation. This is of practical importance, because alcohol and glycerine are often used as solvents, diluted with water, for germicidal preparations. These solutions are inferior to aqueous solutions for local antisepsis because the increased solubility is obtained at the expense of chemical activity.

The most potent germicides used in the treatment of gonorrhea are inorganic salts which dissociate to a very high degree in aqueous solutions. Their ions react separately with living matter, and the resultant germicidal action represents the product of both the cation

and the anion. However, either one of this class of ions may exceed in chemical activity, so that their action is not an equal one.

Not only the quantity, but also the quality of the germicidal action of the cation and the anion may differ. The cation, usually a metal, as stated above for the silver ion. Its action is that of a germicide, killing by coagulation or what is commonly called astringent action. The anion is the acid portion of the salt and its action depends mostly on oxidation.

Of the salts that are used most and that can be recommended, nitrate of silver holds first place as an astringent germicide. Next in order comes zinc sulphate, and then potassium permanganate and nitric acid. The last two are the best oxidizing antiseptics; next comes zinc sulphate, and lastly there is silver nitrate.

In the treatment of gonorrhea, as in the treatment of any other inflammatory process, three factors must be dealt with: first, the infected tissues; second, the infecting microorganism, and, third, the irritating and toxic metabolic products of the specific germ. The chemical activity which results in the formation of the metal protein compound of the microorganism also forms a metal-protein compound with the tissues; and the chemical activity which oxidizes the microorganism also oxidizes the tissues. Every germicide or antiseptic is also an irritant to the affected tissues, and the degree of irritation is directly proportional to its antiseptic power. But, the antiseptic which acts by oxidation also destroys the metabolic products of the infecting germ, also

relieves irritation, hence acts to a certain extent as an analgesic, especially in acute infections.

The gonorrheal inflammations of the urethra which we are called on to treat represent all stages, from the very acute to the very chronic. In the acute stage the tissue, react vigorously to the irritation caused by the gonococcus and its products. A stimulating or astringent antiseptic therefore overstimulates the tissues in this stage of the inflammation. The acute inflammations call for the use of oxidizing or mild germicides, but hydrogen peroxide should be used with great care only, on account of its explosive action, which irritates the acutely inflamed tissues of the urethra. The oxidation produced by potassium permanganate and nitric acid occurs without these irritant properties and, if used carefully, these drugs will give considerable relief to the mucous membrane.

Nitric acid in 1:6000 to 1:1000 aqueous solution is a good oxidizing antiseptic. In chronic inflammation the congestive hyperemia is usually of a low degree. The destructive stage of the inflammatory process has been followed by a stage of regeneration and hyperplasia. The tissues react kindly to a stimulating or astringent germicide.

In the instrumental treatment of chronic gonorrhea, which will be described fully later, a certain limited superficial area of chronic inflammation is changed by the congesting action of the dilatation into an acute process. It should again be irrigated with mild oxidizing antiseptics.

No matter how chronic the inflammatory process is, strong stimulating germicides like silver nitrate should never be used on successive days, because their application produces lesions which need several days for repair. Aqueous nitrate of silver solution of 1:1000 gives the best results, if used every third or fourth day. The indirect therapeutic action of the drug, that is, the action to the deeper structure, consists in the production of an inflammatory hyperemia. In Guyon's deep injections, where we use a 1 to 2 per cent. solution, we depend principally on the indirect action, but, as we can get the same effect more accurately measured and better controlled and with less local lesion by the graduated dilatation, this method of treatment can hardly be rational any more.

The physician who is thoroughly familiar with the action of germicides will never be misled by the published results of experiments conducted in an optimistic but not scientific spirit. He will study the pathology of his cases and use remedial agents, according to simple rational principles. He will use these agents in solutions of such strength as will do the least harm to the tissues, and still exert the desired effect on the germ. All that can be expected of any germicide is that it acts on the surface with which it comes in contact, but the irritation produced by its germicide action may produce a congestive hyperemia of the deeper tissues, and in this way help nature's effort to eliminate infection. The edema occurring after irrigation of the urethra should be regarded in that light.

The **local treatment** of gonorrhea resolves itself into that done by the physician and that done by the patient. The treatment that is done by the patient consists in urethral injections with a small syringe (Fig. 41). The size of the syringe depends on the size of the anterior urethra, it usually varies between 2 and 3 drachmes. If the syringe is too large, the injection is likely to be forced into the posterior urethra, and may cause complications. The patient should urinate before each injection, and if there is much discharge the urethra should be washed out with sterilized water or a boracic

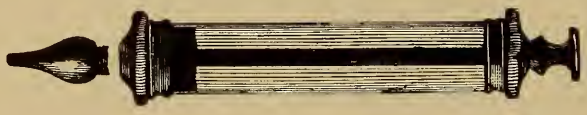

FIG. 41.

acid solution before the injection is made. The injected solution should be retained in the urethra for from two to five minutes. This can be done easily by compressing the meatus with the fingers after the nozzle of the syringe has been removed.

The irrigation of the urethra and the bladder can be done either with or without the use of an injector or a catheter. The injector is either a metal or an elastic instrument. Elastic instruments render good service in the irrigations of the anterior urethra, but when the posterior urethra is irrigated their elasticity is a disadvantage, because the instrument will bend or curve, thus misdirecting the stream of the injecting solution. The injector should have many small openings in its sides or one large opening in the distal end. The

latter is to be preferred for irrigating the posterior urethra and the bladder. The easy and painless introduction of the catheter into the posterior urethra is made possible while the irrigation is being done because the irrigating solution distends the urethra, acting as a guide and a lubricant. In order to irrigate the posterior urethra more efficiently, the instrument is introduced up to the commencement or the middle of the membranous urethra only. When it is desired to irrigate the urethra and bladder without a catheter, the nozzle of the irrigator is provided with an olive-shaped tip, which is fitted to the meatus, thus permitting the use of the urethra as a catheter.

The pressure required may be supplied by the force of gravity, as is done when the irrigator is used, or by the hand of the physician, as is done when a syringe is used. I prefer to use a hand syringe (Fig. 42), which will hold from 100 to 150 c.c.

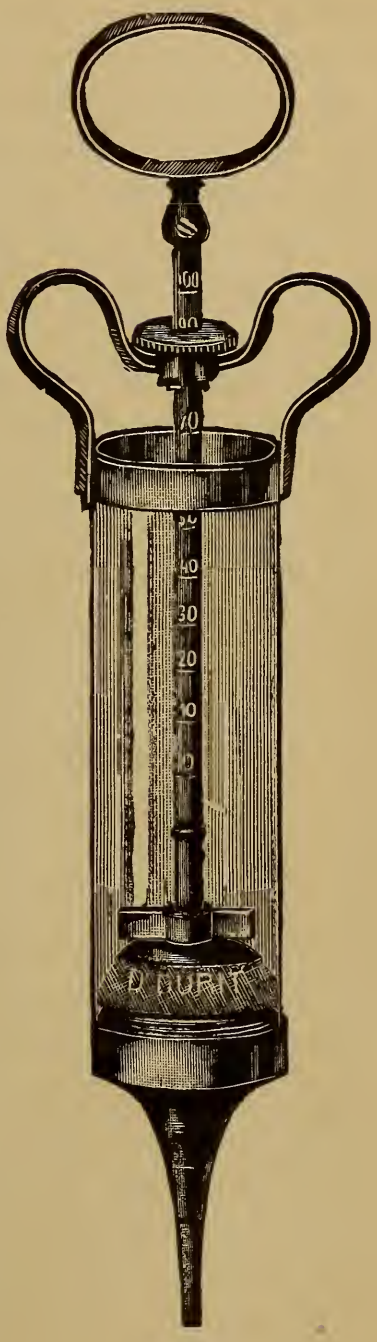

FIG. 42.

of fluid, especially in acute cases, where the irrigations must be done very carefully and very gently, in order to avoid injuring the swollen and denuded mucosa. With the fingers of the left hand on the urethra, and the right hand on the piston of the syringe, the operator can feel the contraction of any muscle, thus enabling him to make less pressure and in this way prevent straining, and perhaps laceration of the mucous membrane. Furthermore, the pressure can be regulated perfectly. It is in our power to induce either contraction or relaxation of the voluntary muscles of the urethra, and to limit accurately the irrigation to a definite part of the urethra.

Irrigations usually are effective in all stages of the inflammation, but skill and experience are required on the part of the physician in making them. The acuity of the inflammatory process is not a contraindication to the irrigation treatment. On the contrary, acute gonorrhea is benefited very much by irrigations made with care and patience. It is the best treatment if the patient can give his time to it and see the physician every day until the acute symptoms have subsided.

For irrigating purposes, potassium permanganate may be employed in aqueous solutions in the strength of 1:2000 to 1:20,000, and in amounts of a pint to 2 quarts. Zinc sulphate is used in amounts of $\frac{1}{2}$ pint to 1 quart and of a strength of 1:50 to 1:200. Nitrate of silver is used in a strength of 1:1000 to 1:6000, and in amounts of $2\frac{1}{2}$ to 8 ounces. Nitric acid is used in a strength of 1:1000 to 1:10,000 and in amounts of a pint to 2 quarts.

INSTRUMENTAL TREATMENT.

The instrumental treatment is of special value in chronic gonorrhea. This statement is not concurred in as much as it should be, because of the fact that medical colleges and dispensaries do not afford their students sufficient opportunity to study the pathology of this very widespread disease, one which probably does more harm than any other. A correct diagnosis cannot be made without a thorough knowledge of the pathology of gonorrhea, and of the correct use of sounds, dilators, and bougies. Of course, this knowledge is also absolutely necessary in order to treat these cases properly. The inexperienced physician will blame his instruments for his poor results. In the hands of the trained physician the instrumental treatment is without danger and offers the surest and speediest recovery.

Every case of chronic gonorrhea, no matter how slight it may be in severity, is accompanied by a decrease in the size of the lumen of the urethra. The purely cellular infiltrations, as well as the hard infiltrations and cicatricial tissues, diminish the elasticity of the tissues into which they have been deposited. The dilatation will first obliterate the urethral folds, and further dilatation is done at the expense of the elasticity of the urethral tissues. This elasticity is great in the normal tissues and only slight in diseased tissues. The latter are rendered hyperemic and sometimes slightly damaged by the dilatation. The graduated dilatations act, first, on the superficial cellular

infiltrations, and then on the more deeply situated and harder infiltrations. The greatest number of chronic gonorrheal infiltrations can be absorbed in this way. In the strong infiltrations surrounding the glands, the interior of the gland is often influenced favorably long before the surrounding infiltration is absorbed.

Following each dilatation there is a transitory increase in the severity of the clinical symptoms because the irritation caused by the instrument has stimulated nature to make an increased effort at repair. The increased pathologic secretion comes from the infiltrated patches as well as from the glands. The weaker dilatations attack and dissolve the infiltrations rich in granulation tissue, while the stronger or more forcible dilatations influence also the infiltrations containing organized connective tissue. The truth of this statement can be verified by a urethroscopic examination.

The appearance of the diseased surface changes after each dilatation. Connective tissue freed from granulation tissue is gradually coming to the surface. The action of dilatation is the same in infiltration of every degree. The reaction to the dilatation may differ in quantity but not in quality. The cellular infiltrations decrease gradually with each dilatation, but the remaining connective tissue is not freed from cellular elements, and is, therefore, still capable of reacting and of being absorbed.

A few days after a successful dilatation the urine

is found to contain secretion and threads in abundance. The patches of connective tissue, wrongly called scars, that appear during the course of the dilatation, are seen for from ten to twenty days only. They then gradually disappear. Oberlaender and Kollmann are convinced that connective tissue reacts and is absorbed for many years, even decades.

The action of graduated dilatation is both a mechanical and a dynamic one. It is massage treatment that produces changes in the vital properties of the pathologic tissues. Finally, a stage is reached in which the dilatations fail to cause any more reaction and absorption. Except in isolated instances this is the stage of cure.

The inflammatory process is most persistent around the glands. After the stage of reaction is passed, hard nodules of the size of a pea or smaller may be seen in the vicinity of the inflamed glands. Lohnstein has called these nodules fibrous depositions. They are the remains of hard infiltrations, and usually contain glands, that are surrounded by organized connective tissue. Sometimes the gland itself has undergone connective tissue changes. In large urethras the dilatations may cause the absorption of all the infiltrations of the mucosa, but not of the infiltrations in the erectile tissue. These latter escape the effects of the treatment by getting out of the way of traction.

The use of dilatations in the treatment of gonorrhea is not new. Dilatations have been practiced empirically and in rather a crude way for a long time. The beneficial effect obtained from the introduction of a common

sound into the urethra is due to its dilating and congesting action on the most prominent infiltrations. The graduated dilatations are an improvement on the old sound method. They are based on the special pathology of the condition, are controlled by the eye of the operator, and are executed with adequate instruments. Neelson and Oberlaender have given us the special pathology of the gonorrheal affections, while Nitze and Valentine have supplied us with a urethroscopic lamp which is invaluable in diagnosis and indispensable in the rational treatment of gonorrhea. Kollmann, with the aid of his instrument-maker, Heynemann, of Leipzig, has constructed instruments which permit of the treatment of any part of the affected urethra.

CHAPTER IX.

TREATMENT OF THE VARIOUS STAGES OF GONORRHEA.

ACUTE GONORRHEA.

Acute gonorrhea is a contraindication to the use of instruments either for diagnostic purposes or for treatment. For a diagnosis we must depend mainly on the microscopic examination of the secretion vide page 11 and on the various diagnostic glass tests vide page 22. The treatment is limited to the use of medicines internally, injections, and irrigations.

There is no one way of treating acute gonorrhea which can be termed the best method of treatment, because the success of any method depends in a large degree on the skill and experience of the physician and the willingness of the patient to follow instructions. The best results are obtained from daily irrigation with a warm potassium permanganate or nitric acid solution in increasing strength and given with a hand syringe without the use of an injector.

The first irrigation should consist of one or two quarts of a 1–10,000 to 1–20,000 aqueous solution at a temperature of 40° to 45° C. Three or four syringefuls are used to wash out the anterior urethra, and the remainder is allowed to flow into the bladder, which should be emptied after each injection. Much patience

and skill are necessary when this first treatment is given, especially in very acute cases. Fig. 43 shows the manner in which the syringe is used, with the patient in the standing position. As little force as possible should be used, because the acutely inflamed mucous membrane is less elastic than the remainder of the tissues, and is injured if the irrigating fluid causes too much tension. The ballooning of the urethra must be

FIG. 43.

done gradually or abandoned entirely during the first few irrigations. As the acute symptoms subside, the strength of the irrigating solution is increased gradually to 1–2,000. Before each treatment the patient is questioned as to how the previous irrigation acted; how long afterward he noticed increased burning of the urethra, and how often he had to urinate. According to the reaction produced by the previous irrigation,

the strength and the amount of the solution used is increased or decreased from day to day. Each patient must have his case studied carefully and treated individually. Until the acute symptoms have subsided, it may be advisable to irrigate twice a day, irrigating the urethra and bladder in one sitting, and the anterior urethra alone in the other.

In from four to ten days, when the discharge usually is stopped, the patient is directed to take two or three injections at home, visiting the doctor only once a day for irrigation. Internal medication given in connection with the irrigation treatment does not seem to have a beneficial effect. The urethra is kept irritated, and it does not permit increasing the strength of the irrigating fluid as rapidly as can be done when no internal medication is given. Less experience is required when the irrigations are given with Valentine's (Fig. 44) or an improved irrigator, than when the syringe is used. Therefore, the former are to be recommended to physicians who treat these cases only occasionally. If the irrigation is done by means of an injector or a catheter, the urethra is not ballooned, and the drug remains in contact with the

FIG. 44.

mucous membrane only when flowing out. The irrigating fluid can be used in greater strength when the injector is used.

Some clinicians limit the irrigation to the anterior urethra unless there are distinct symptoms of a posterior urethritis. Others begin with posterior irrigations on the supposition that a posterior infection exists. No fears need be entertained that an infection will be produced by continuity; on the contrary, irrigations of the whole urethra given properly will prevent just such an occurrence. I have not had a single case of epididymitis in the past three years in any acute case that I was permitted to watch closely, pushing the irrigation treatment.

In cases where the discharge is profuse and purulent, and when the patient cannot take daily irrigations, it is advisable to give internal treatment (ten minims of oil of sandalwood, three times a day) for two or three weeks, provided that the inflammatory conditions are subsiding under its influence. In some cases internal medication is absolutely without benefit, and it should then be discontinued entirely. The therapeutic action of the balsamics is enhanced if the liquid diet is cut down and the urine concentrated. At the end of the first or at the beginning of the second week the local application of a germicide is added to the internal treatment.

The patient is directed to make injections three to four times daily and to retain the fluid in the urethra for from two to five minutes. A 1–5,000 to 1–500 solu-

tion of potassium permanganate or nitric acid the strength being increased gradually, are the ideal injections for this stage of the inflammation.

A week or two after the injections were begun, the acute symptoms ought to have subsided considerably. The urethral mucous membrane is then not suffering so much from the irritation produced by the inflammatory products. The permanaganate of potash may be replaced gradually by a more stimulating (irritating) germicide. An aqueous zinc sulphate solution in the strength of 1:200 to 1:50, is used once a day, in the evening, at first, the frequency of its use being increased until no more potassium permanganate is used.

The patient afflicted with acute gonorrhea should rest in bed as much as possible, and, when up, wear a well-fitting suspensory, padded with cotton. The cotton should be changed every day, and should be dusted with starch, in order to prevent the forming of eczematous conditions, due to sweating.

All fermented drinks are injurious. Even an excess of water should be avoided, since micturition disturbs the rest of the urethra.

The patient's food should be simple, bland and not flavored. The diet should consist as much as possible of vegetables.

Milk, with little or no coffee, in the morning.

Soup, vegetables and farinaceous food, with but little meat at noon, and milk, farinaceous food and fruit for supper.

The last meal should be taken at least two hours before

going to bed, in order to prevent erection and emissions. The patient should sleep in a cool room, and not cover himself up too warmly. He should wear good footwear, especially in winter and in wet weather, because wet and also cold feet favor the occurrence of strangury and favor the appearance of cystitis.

In order to protect the clothing, the patient should lay cotton or gauze, soaked with 2 per cent. lead acetate solution, between gland and foreskin.

If there is much swelling of the penis and edema of the prepuce, the treatment may have to be limited at first to the applications of hot compresses (flaxseed), and to regulation of the diet. Frequent and painful urination can be reduced by hot hip baths or hot applications to the penis; in severe cases the following prescription is of value:

℞ Ex. hyoscyamii, } āā..... gr. v.
Ex. cannabis Indica, }
Sacchari, q. s. ad., ... ℥j.
M. et ft. chart. No. X. Three to four powders a day.

For terminal bleeding, which sometimes occurs during the acute stage, the following prescription is of value:

℞ Ferri chloridi, ... gr. xxiv.
Syr. rubi Idaei, ... ℥v.
Aq., q.s., ad.,..... ℥v. M.
℥j six to eight times a day.

Injections and balsamics should be stopped for the time-being, if either frequent and painful urination or terminal bleeding occurs during treatment.

In the following will be given some prescriptions of the most efficient injections:

℞ Ac. nitrici, ... gr. iii to xv.
Aq., q. s., ad., ... ℥viii.
Inject three to four times a day.

℞ Ichthyol, ... grs. xx to ℥jss.
Aq., q. s., ad., ... ℥iv.
Inject three times a day.

℞ Zinc sulphs. carbol., ... gr. viii to xvi.
Aq., q. s., ad., ... ℥viii.
Use as an injection.

℞ Alum crudi, ... ℥j to ℥ij.
Aq. font., ... ℥viii.
Use as directed.

℞ Zinc acet., ... gr. x to xvi.
Aq., q. s., ad..... ℥iv

℞ Zinci sulphatis,
Plumbi acetatis, āā..... gr. 7 to 40.
Tinct. catechu, ... ℥ 1 to 2.
Aq., dest. q.s., ad., ... ℥ 4.
(Kollmann.)

If the secretion has not ceased after a month or two from the beginning of the affection, the case is usually in the subacute stage (soft infiltrations) and instrumental treatment is indicated.

CHRONIC GONORRHEA.

Chronic gonorrhea is the field for instrumental diagnosis and treatment. The instrumental treatment is indicated by the pathologic changes in the mucous membrane as seen in the urethroscopic examination. Although the pathologic lesions are dependent on the

presence of the gonococci, they are not always found in the secretions. The physician must be careful, especially at the beginning of treatment, when there is still some uncertainty as to the diagnosis, not to crowd instrumental treatment. Neurasthenics and those whose resistance has been reduced by excesses do not stand instrumental treatment well. The reactions are usually stormy and affect the general health of the patient very much.

a. The soft infiltrations are manifested clinically as subacute or obstinate acute cases. The very severe acute cases, which last from three to four months, and are often accompanied by complications, are not among the soft infiltrations. In the case of the soft infiltrations there either never was much secretion and apparent inflammation, or there was at first well-marked inflammation without much secretion, which was followed by a very lingering stage. Another characteristic feature of these cases is the fact that the lapse of time since the original infection is a very short one, usually only a few months. The clinical symptoms are not always an indication of the pathologic changes in the mucous membrane. It is impossible always to give a reason for this discrepancy between the clinical symptoms and the pathologic findings. We are, therefore, not justified in making a diagnosis of the character of the urethral affection before a urethroscopic examination is made.

A patient who can bear the irrigations well will also bear the urethroscopic examination. We should also

make it a rule always to sound or catheterize a patient as soon as it is possible to do so in order to determine the existence of coarser changes and to anticipate trouble.

Soft infiltrations of the anterior urethra are usually accompanied only by soft infiltrations of the posterior urethra unless there exist the remains of an old infection. The passage of sounds or of a catheter is somewhat painful, and causes some bleeding. Narrowing of the urethra is not a prominent part of this form of infiltration.

Having made the correct diagnosis, it is advisable to wait a few days before beginning the treatment, because the primary examination usually is followed by some reaction, such as burning on urinating, and a slight increase in the discharge. If this reaction does not subside spontaneously within a day or two, warm irrigations with potassium permanganate or boric acid, followed by silver nitrate, are indicated. We may dilate without waiting for the passing off of the reaction. If the caliber of the meatus permits of the introduction of a four-branch dilator, it may be used at once. Unless there are patchy infiltrations at the orifice or in the glans penis, a previous preparation of the urethra with straight sounds is not necessary in this class of cases. The dilator must be employed here as well as elsewhere with care. Lacerations of the orifice deserve special attention and may demand the use of short dilators.

The irrigating dilators are also used with great benefit in the soft infiltrations, especially if the excretory ducts of the glands are swollen and stopped up with

stringy secretion. In order to avoid overirritation, the first dilatation should be done with the size of the instrument not more than one or two numbers larger than that of the urethroscopic tube used during the examination. The secret of the successful treatment of chronic gonorrhea lies in the adequate gradation and the timely repetition of the dilatation. It is not possible to do this successfully without having had experience, but strict observation of the rules laid down below will protect the beginner from gross mistakes and failures.

There should not be much bleeding either after urethroscopy or dilatation, especially not at the commencement of the treatment. The change that takes place in the secretion after dilatation differs in each case. A case which may have shown only filaments before dilatation was begun may be accompanied by a very severe discharge afterward, while in another case the reverse may be true or there may be complete cessation of the secretion. It is not always possible to give a satisfactory explanation for these varying conditions. Much depends on the nature of the disease and on the individual peculiarities of the urethral mucous membrane. In the case of the soft infiltrations the pain on urination and erection disappears after each dilatation within from twelve to twenty-four hours. If the pain lasts longer than this, then we have either dilated too much, or a mistake was made in diagnosis.

The treatment to be given between the dilatations depends on the reaction in general and on the increase in secretion. If it is impossible for the patient to receive

treatment daily, he must be instructed to make from three to four injections daily with potassium permanganate or with zinc sulphate. However, in order to secure speedy and complete healing, it is desirable to make daily irrigations with potassium permanganate, or every third day with nitrate of silver. The nitrate of silver irrigations are to be preferred in cases where the mucous membrane reacts kindly to this agent. Irrigation of the posterior urethra should always be done by the physician.

The following course of treatment is advisable if the patient can give the necessary time to it and if the physician is desirous of using all means possible to produce a speedy cure. On the day following the first dilatation, an irrigation with potassium permanganate in the strength of 1–6,000 to 1–3,000 is given.

℞ Potassii permanganati, ... gr. 2½ to 5.
Aquæ, q. s., ad.,..... quart 1.

On the second day a 3 to 4 per cent. boric acid wash followed by a nitrate of silver (1–4,000 to 1–1,000) irrigation is given,

℞ Argent. nitrat., ... gr. j to iv.
Aq. destill., q. s., ad.,..... ℥viii.

and on the third day and perhaps also on the fourth and fifth days, potassium permanganate is to be employed again. Depending on the severity of the reaction produced by the first nitrate of silver irrigation, two, three, or more days are allowed to elapse before another application is given. The discharge ought to diminish

considerably, the urine clear up, and the filaments become less numerous in from twelve to twenty-four hours after the use of the nitrate of silver. If these changes do not occur, it is an indication that the case is not ready for such irrigation. Potassium permanganate irrigations must then be continued. If the treatment has lasted for some time, nitrate of silver should be tried again.

Soft infiltrations that are discharging slightly and that do not react promptly to the dilatations and on which silver salts do not exert a favorable effect, are influenced satisfactorily by zinc sulphate or zinc tannin used every other day. It does not matter whether only the anterior urethra or the entire urethra is to be irrigated. Suitable injections should be taken at home with a small syringe once or twice a day as long as there exists a considerable discharge. Daily irrigations, either with or without a catheter, should not be used for weeks unless it is impossible to control the discharge. Too much treatment will prolong the inflammation, while not enough fails to control the disease.

In soft infiltrations the reaction that follows the dilatations is somewhat proscribed, and even though the secretion may be increased considerably, the condition is not of long duration. Within four to eight days the condition will return to what it was before any dilatation was done. The second and subsequent dilatations should be repeated at intervals of ten days. The increase in dilatation should not be more than one to two numbers at each treatment, unless no reac-

tion followed the last dilatation given, and the urethroscope fails to show any marked lesions. In these exceptional instances the increase may be from three to five numbers. The increase in dilatation is always governed by the apparent increase of the irritation and secretion following the last instrumental treatment. If more than one week is required to overcome the reaction, the increase at the next dilatation should not exceed one number, and in some instances it may be advisable not to increase the number at all. If, on the contrary, the dilatation produces no reaction, an increase of two numbers will not cause any trouble.

If the catarrhal condition becomes lessened in the intervals between dilatation, these may be made longer, until finally, when the secretion has ceased and the filaments have disappeared, dilatation treatment is discontinued. It is advisable, however, to make one or two additional injections of nitrate of silver solution in the strength of 1–1000 to 1–500.

Relapses also occur in the case of the soft infiltrations, but they are not very common. If, on urethroscopic inspection, the five-glass test and the milking of the prostate give negative results, the treatment may be stopped for several weeks when another examination is made. In these infiltrations the mucous membrane reverts practically to its normal condition, although some of the crypts may show signs of irritation for some time afterward.

The degree to which the dilatation may be carried is governed entirely by the susceptibility of the patient

and the reaction that is produced. Neither the absence of gonococci nor the histologic condition of the filaments justifies the physician in pronouncing the patient cured. It is of little importance whether the filaments contain only epithelium, or epithelium and leucocytes. Filaments consisting of mucin and leucocytes are irrelevant. The patient should be urged to hold the urine as long as possible before visiting the physician, because the urine is a guide to the healing. A rich purulent secretion produces a turbid urine with filaments; whereas a slightly purulent, muco-purulent and purely mucous secretion contains only filaments.

It is only infrequently that the prostate is affected in soft infiltrations.

As to the duration of the treatment, it may be said that mild muco-purulent catarrhal conditions heal after three or four dilatations and from six to eight irrigations with nitrate of silver, or in from five to six weeks. The more severe the catarrh, the more time is required to effect a cure. If healing does not take place in the time expected, another examination should be made, when it will probably be found that the case is not of the uncomplicated variety.

The affections of the posterior urethra are seldom well-marked in the soft infiltrations of the anterior urethra. This is easy to understand when we take into consideration the histology of the anterior urethra. It is more conducive to the lodgment of infective agents than is the posterior urethra. The conditions are different if an infection of the prostate and seminal vesicles

has taken place. An infection of the prostate cannot be governed with any degree of certainty, but experience teaches that the obstinate cases of prostatitis are seldom accompanied by soft infiltrations only of the anterior urethra.

Soft infiltrations of the posterior urethra are of short duration and cause the patient almost no suffering. There may be present a feeling of tension and of tickling in the perineum, and a slight increase in the frequency of urination. Even severe purulent inflammations of the posterior urethra do not always manifest themselves by marked symptoms. It is only after the inflammation reaches a certain depth, especially when it attacks the muscular fibres, that there is severe tenesmus on urination.

The treatment of this condition varies as does that of the anterior urethra, depending on the stage of inflammation. We may give daily irrigations with potassium permanganate or two to three times weekly with zinc sulphate ($\frac{1}{2}$ per cent. to 1 per cent. solution), and perhaps once or twice weekly irrigation with a $\frac{1}{2}$ to 1 promille solution of nitrate of silver.

Dilatation of the posterior urethra seldom is necessary in this class of cases. If the inflammation fails to yield to irrigations, we are dealing with a case of hard infiltrations. From the posterior urethra the inflammatory process usually extends to the intravesicular portion of the urethra, to the trigonum vesicæ. The cystoscope discloses a urethro-cystitis which is characterized by a deep red color and great brilliancy of the

epithelial covering of the trigone. The internal administration of balsamics may be advisable in this class of cases as an aid to the local treatment of the urethra and bladder.

b. The hard infiltrations are of the first, second and third degrees. The treatment of the first two varieties is practically identical and will be described as such. From fifty to seventy per cent. of all cases of chronic gonorrhea come under these two classes. Calculating from the time infection takes place, it takes about three or four months for the case to develop; but if left alone or if treated irrationally, the case may last ten, twenty, or more years without losing any of its infecting power. From this case there may spring a severe acute gonorrhea on the mucous membrane of any other person. The old belief that a chronic gonorrhea of long duration produces only a mild infection is a wrong one.

The culture medium plays a very important rôle in the production of an infection. A susceptible mucous membrane may be attacked by a virus of low vitality and made the seat of a very virulent infection. Any secretion, no matter how slight in quantity, from tissues known to be infected by the gonococcus should not only be looked on with suspicion, but must be pronounced to be infectious. In this class of cases no conclusion can be drawn from the appearance of the gonorrheal discharge as to the duration or location of the infection nor as to whether the infiltrations are deep or superficial. The discharge increases and becomes

purulent in reinfections, but the same symptoms may be apparent in relapses. There are many reasons why the discharge at one time appears in the form of a drop and at other times in the form of filaments. 1. The most important factor in determining the character of the discharge is the location of the infection. An infection in the *fossa navicularis* will manifest itself at the meatus much sooner than an infection of the bulb. 2. The structure of the penis is also a determining factor because well-developed longitudinal folds will hold more of the discharge than slightly developed and partly obliterated folds. 3. A naturally dry mucous membrane will keep more pus back than a naturally moist one. 4. An active patient is more likely to have a discharge than a patient who has sedentary habits. The meatus will often be dry in the morning on arising and pus will make its appearance after the patient has been walking about for a while. 5. The consistency of the pus determines whether or not it will make its appearance at the meatus. For these reasons the appearance of a discharge at the meatus is an important but by no means a diagnostic symptom. Posterior urethritis, prostatitis, and sometimes even cystitis may complicate a chronic gonorrheal inflammation without being manifested by subjective symptoms. However, it is not always necessary to do a posterior urethroscopy at the beginning of the treatment. The anterior urethra is examined with the urethroscope before commencing the treatment, and, if possible, before each dilata-

tion. A record should be kept of the results of each urethroscopic examination. The following outline by Kollmann and Oberlaender (Fig. 45) will aid in the taking of the records.

A microscopic examination should be made of the urethral and prostatic secretions. If no secretion can be obtained, the filament in the urine should be examined. The determination of the source of the secretion (pus or filaments) is not always an easy matter, and it may be necessary to make repeated examinations. A definite diagnosis should be withheld until every aid in diagnosis has been employed.

The treatment of the disease is relatively simple, and gross therapeutic errors are, as a rule, only made when the disease has not been located correctly. Before commencing the treatment, the physician must inform himself as to the stage of the inflammation at that time, and acute exacerbations of chronic conditions must be treated by irrigations and perhaps by internal medication before commencing the dilatations for the purpose of treating the disease proper. It is always best to wait a few days longer before instituting instrumental treatment, because, otherwise, one may be surprised disagreeably by the reaction following the first dilatation. This is very important for the progress of healing, and in order to be on the safe side it may be advisable to start dilating with metal sounds first, using the dilators later on, when more familiar with the case. The reaction following the first dilatation is waited for and watched carefully, and then made to

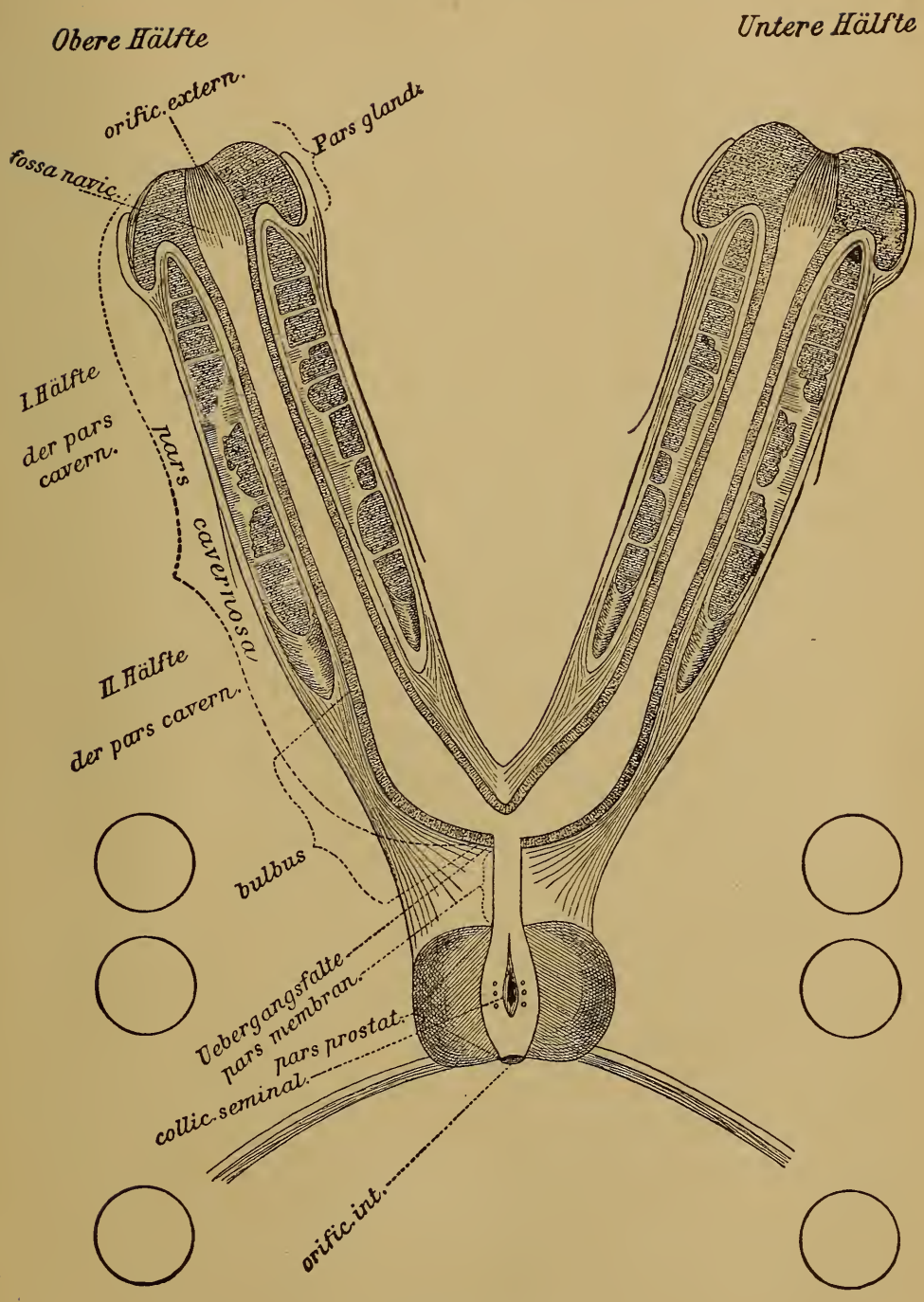
Obere Hälfte
Untere Hälfte
orific. extern.
Pars glandi
fossa navic.
I. Hälfte
der pars
cavern.
pars
cavernosa
II. Hälfte
der pars cavern.
bulbus
Uebergangsfalte
pars membran.
pars prostat.
collic. seminal.
orific. int.

FIG. 45.

disappear by irrigations of potassium permanganate and nitrate of silver. Before another dilatation is done, this reaction must have run its course and the secretion must not be any greater in amount than it was before the first dilatation.

Any slight pain on urination which was caused by the instrumental interference must have disappeared before another dilatation was done. Sometimes fourteen days or more will elapse before conditions are such that another dilatation may be attempted. In the later stages of the condition and in cases accompanied by rich epithelial changes the effect of the dilatation manifests itself by the appearance of large quantities of epithelial scales in the urine. These latter soon disappear after proper irrigation treatment. If there was much hemorrhage following the last dilatation, it is best to lengthen the interval between dilatations two days more than would otherwise be done.

In the course of the graduated dilatations there is reached eventually a point where the same number must be used for several dilatations in order to keep the reaction within the prescribed limit. An increase is not permitted until the reaction has become very slight. There can be no deviation from the rules laid down with reference to the gradual increase in dilatation unless the case has been studied during previous treatment. If it has shown itself to be unreliable in the reactions produced it would be absolutely necessary to adhere closely to the instructions given during the course of the treatment. To deviate from

this course and to start at once with a strong dilatation will tear the infiltrated patches and result in an abuse to the tissues that cannot be remedied easily.

At the commencement of the treatment we are usually obliged to use straight sounds of small size, or small two-branched dilators, but as healing progresses we can gradually resort to the use of larger instruments, such as the three and four-branched dilators. As long as there is a discharge at the meatus or filaments appear in the urine that comes from the anterior urethra, we must not jump several numbers in the dilatation from one treatment to the other.

Besides regulating the dilatations and controlling the discharge, we must keep ourselves posted as to the status of the urethral affection by frequent urethroscopic examinations. The importance of this procedure will be apparent when we consider that the dilators must be changed during the course of the treatment, according to the disappearance of the infiltrations. If the treatment must be long-continued, the urethra should not be entered with instruments, especially not metal instruments, more than two or three days in succession. This is of importance in cases in which there is much discharge, and in those inclined to exacerbation. In this class of cases the dilatations can usually be repeated every six to ten days, but how long this can be done it is impossible to say before-hand, especially in strongly developed cases. Factors which will influence the length of time of the treatment are peculiarities of the mucous membrane or of the organism in general, and

the presence or absence of diseases of the adnexa. Do not change the method of treatment if the process of healing is not satisfactory, but correct the manner of applying the treatment, so as to suit the case. This holds true for the use of antiseptics as well as for the use of instruments. Much experience is required to do the right thing at the right time.

In the mixed infections (*staphylococcus pyogenes aureus*) or in infections of the urine, the result of treatment sometimes is very discouraging. Patience and careful work are essential to good progress. At last we may be able to dilate without producing chills and fever or other sequelæ, such as pain in the joints and muscles, or a general feeling of disease. We way think that the stage of fever reaction has passed, when suddenly, after a somewhat stronger dilatation, a systemic reaction again makes its appearance. The treatment cannot be hurried; doing so will interfere with good results.

No case in this class can heal without relapses. If we meet with such an anomalous case, it is probable that the relapses have been present during a previous treatment. The clinical symptoms of a relapse may be weaker or stronger than the original infection, but in the latter case it is probably a reinfection. This suspicion is confirmed if, on urethroscopic examination, we find that the inflammatory conditions have spread over the original area again, or are even reaching beyond the original limits, and if a great number of gonococci are found in the discharge. We can only call it a relapse if weeks or months of comparative well-being

and continued improvement have intervened, and if the clinical improvements have been corroborated by the urethroscopic findings.

A typical relapse is preceded by urethroscopic changes and by the appearance of filaments in the urine in gradually increasing amounts. The duration of relapse is uncertain, but it can be influenced more easily by the treatment than the original infection. Relapses occur most often in the upper half of the bulb. In this class of cases we usually get from two to three relapses before the patient is cured definitely.

The irrigating dilators make it possible to influence simultaneously the deeper structures by dilatation and the superficial ones by irrigation. In soft infiltrations which do not extend deeply into the tissues, the beneficial influence of these measures is relatively limited. It consists principally in spreading out the folds and enabling us to make a perfect irrigation of the entire surface of the mucous membrane.

In the hard infiltrations of the first and second degrees, we must deal with superficial and deep affections of the mucosa, a promising field for instrumental treatment. The irrigating dilators are especially to be recommended in cases where the common dilator does not give satisfactory results. The patients bear this treatment better than when the common dilators are used, and therefore they are especially useful in susceptible cases. The irrigating fluid should be used as warm as possible. The rules given for the use of the simple dilator hold good here too.

The rules given under soft infiltrations as to the discharge of the patient hold good here, too, and it may be said further that the more work and time is demanded by the healing process, the longer the patient should be kept under observation before he is discharged finally. The filaments in the urine should not contain leucocytes in any considerable amount.

SPECIAL THERAPEUTICS OF THE ANTERIOR URETHRA.

In the case of the hard infiltrations of the anterior urethra, Kollmann advises to begin the dilatation treatment with straight metal sounds. He lays down the following rules: Begin with No. 15 Charrière and increase in the same sitting, if narrow parts or pains do not prevent it, to No. 20. If the reaction is slight, the procedure may be repeated four or five times, within fourteen days, increasing one to two numbers at the beginning, and one to two numbers at the end of each treatment. There need be no fear on the score of introducing several instruments in one sitting, because they do not pass beyond the bulb and any irritation of the prostate gland or the ejaculatory ducts is excluded.

The size to which the sounds may be increased depends, first, on the caliber of the meatus. In a large number of cases No. 28 can be reached gradually without meatotomy. After having reached this number, it is advisable to discard the sounds and use the dilators.

The first dilatation should be made very carefully,

increasing only one or two numbers over the size of the urethroscopic tube which passes the meatus with ease and without causing any reaction. If the tube produces a reaction, the dilatation should not be carried beyond the number of the tube.

Straight instruments with a large surface dilatation should be used as long as there exists a uniform distribution of the infiltration. In small urethræ and when strong infiltrations are present, it may be necessary to use two-branch dilators first, and not until the healing has progressed somewhat should the four-branch dilators be used. The length of the penis must also be considered in the choice of the dilator.

The irrigating dilatation is best done with a three or four-branch Kollmann instrument. After a few dilatations with the straight dilator, the infiltrations may be dissolved into patches, or those in the shaft may be absorbed, so that only the infiltrations of the bulb remain. The latter are not acted on by the straight dilator because of the large size of the bulb. Therefore, the urethroscopic examination of the bulbous region reveals a dry epithelial surface with the central field of the funnel covered with pus.

The bulb is treated with a curved dilator, the distal part of which has entered the membranous urethra. With the patient in the recumbent position, the dilator is in place when the shaft is at an angle of between 90 and 45 degrees. In order to determine its location more accurately, the distal end of the instrument may be palpated through the rectum. It does not matter

whether the dilator has a Dittel or a Guyon curve, but it is of importance that its dilating portion conforms more or less to the shape of the bulb. In the case of patients who have a long anterior urethra, we may use dilators which dilate in the shaft as well as with the curve. A short anterior urethra may be dilated with an instrument that dilates only with the curve.

Mistakes are often made in the dilatation of the anterior urethra which retard the healing of the case. These consist either in too much or too little dilatation, in too rapid dilatation, or in choosing the wrong instrument. The mistake made most often is to combine too great dilatation with too short intervals between each dilatation. This does not permit of the gradual retrogression of the affected tissues throughout their entire extent. The mucous membrane heals only at the points of greatest dilatation. It does not matter much whether the dilatations result in the production of a tear in the surface of the mucous membrane, or trauma or contusion of the submucosa; the process of retrogression in either case in incomplete or faulty. These results are caused by the use of a faulty technic, even when the instrument is a good one. These cases are recognized urethroscopically by the existence of numerous loose hypertrophied folds and glandular and periglandular infiltrations. In such cases dilatation should not be made for a month or two, or even more, depending on the severity of the previous treatment. In the meantime mild irrigations or injections may be employed, and the adnexa treated if they are affected.

Before resuming the dilatations, a careful urethroscopic examination should be made for the purpose of determining the location of the diseased parts. This can be done better now than immediately after the cessation of the instrumental treatment, because the affected parts stand out more prominently. Choose a suitable dilator, and exercise great care in its use, so as not to do further harm. Dilate slowly and, if necesary, use the same number at several dilatations.

The healing may be retarded further because the inflammation has localized itself in isolated crypts and glands and their immediate surroundings. The infiltrations are located deeply in the tissues, and therefore are affected only slightly or not at all by the dilatations.

In these cases the urethroscopic examination shows pus discharging from the excretory ducts of the glands and their surroundings. The central field of the membranous funnel is covered with pus even after a long-continued course of instrumental treatment.

In gonorrheal infiltrations which have failed to yield to the common dilator, Oberlaender has of late been using the irrigating dilator twice a week, with most satisfactory results. He uses equal parts of zinc sulphate and alum in the strength of 1–200 to 1–50. We must try to obtain high dilatations.

If this treatment also fails to effect a cure, the glands must be destroyed by electrolysis. For this purpose Kollmann's bayonet-shaped electrolytic sounds (Fig. 9) are the best. In the glands with gaping excretory

ducts use the blunt electrolytic sound, and in glands with narrow excretory ducts pointed electrolytic sounds are used. The sound is connected with the negative pole of the battery, while the positive electrode is applied over the symphysis. The electric current is turned on slowly to about 1.5 to 2.5 milliamperes. It is not advisable to use a current stronger than this. Gas bubbles are generated and can be seen as soon as electrolysis is well under way. The first sitting should not last more than one or two minutes. Kollmann does not, as a rule, extend the treatment over one minute either at the first or at subsequent visits.

After a successful electrolysis the parts surrounding the gland are distinctly congested, and they remain so for from four to six days, when the absorption of the destroyed tissues begins. It is completed in from four to six or eight weeks.

The long time required to produce healing is a great disadvantage of this method of treatment. If the glands are not too close together, more than one gland may be destroyed in one sitting. The swelling that follows each treatment makes it impossible to do clean work in the immediate neighborhood of the tissue treated.

If, instead of dealing with an affection limited to a few glands, we have an extended surface affection, we can make use of another instrument devised by Kollmann. It consists of a hollow hard rubber cylinder (Fig. 46), about 10 cms. in length. The walls of the cylinder are pierced by rows of small holes. The distal end of the instrument is provided with an olive-

shaped tip, which prevents the solution from flowing farther back in the urethra than is intended. The proximal end of the instrument is conical in shape, for the purpose of enclosing the urethra in front. Inside of this rubber cylinder is a metal tube, which is connected with the electric current at its proximal end. The instrument is introduced and an aqueous solution or preferably a physiologic salt solution is injected and the urethra distended. The fluid is prevented from

FIG. 46.

returning by a stop-cock at the proximal end of the metallic tube. The negative pole of the battery is attached to the instrument, and the positive pole is placed over the symphysis.

The current is turned on gradually to 1.5 to 2.5 milliamperes. The duration of the exposure is about five minutes. The electrolysis takes place through the holes of the instrument and the surrounding liquid in a much more mild manner than is the case with Kollmann's sound. The electrolytic action can be seen on the mucous membrane in the form of round red spots. The instrument was primarily not intended for this purpose. It ought to serve as an indifferent electrode for intraurethral galvanization in cases of

neurosis. When the instrument is used for this purpose, the urethra must be well ballooned out with water and kept so until the end of the treatment, The spots mentioned above are not allowed to appear on the mucous membrane. The instrument is connected with the positive pole and the application should not last longer than two minutes.

This form of electroylsis is not used very much for the reason that dilatation and irrigation bring about the desired results more quickly.

Incision of the inflamed crypts and glands with a small endoscopic knife and the subsequent cauterization with nitrate of silver or chromic acid crystals liquefied on the end of a urethroscopic sound has not yielded particularly encouraging results. The incision of follicles which stand out like great bubbles is to be recommended.

It is very important to remember that the anterior urethra must be healed before any permanent improvement of the posterior urethra and its adnexa can take place. As long as the anterior urethra is affected, reinfection of the posterior urethra may occur at any time. Relapses are not as common in the posterior urethra as they are in the anterior urethra, where glands are more abundant and better developed. The treatment of a relapse does not differ in any way from that of the original affection. The knowledge gained in the treatment of the original affection is a great aid in the treatment of a relapse.

SPECIAL THERAPEUTICS OF THE POSTERIOR URETHRA.

Hard infiltrations of the anterior urethra are, as a rule, accompanied by the same pathologic changes in the posterior urethra. Long-standing affections of the posterior urethra usually are not limited to the mucous membrane. They extend deeply into the tissue, attacking the excretory ducts of the sexual glands, and through these the prostate, the seminal vesicles, and, perhaps, the epididymis. Treatment of the posterior urethra must, therefore, include treatment of the seminal vesicles, the sexual glands, and their excretory ducts.

The infiltration may be limited to the colliculus seminalis, the ejaculatory ducts, or the prostatic ducts, the superficial mucosa, or it may extend deeply into the submucous tissue. The infiltrations and the secondary contraction of their connective tissue fibers may produce stiffness of the walls of the affected ducts. The lumen is narrowed or may be closed up entirely; or it remains wide open and a spermatorrhea or prostatorrhea may result.

Neither the acute nor the chronic gonorrheal process is arrested by the vesical sphincter. Either of these processes may spread into the bladder and affect the trigonum. The affection is usually most marked at the neck of the bladder. The cystoscope shows the mucous membrane of the trigonum reddened and swollen and bulging, or reddened only in spots, and in some instances it is covered with follicular excrescences or a delicate

network of vessels. The surface of the mucous membrane is covered with dead epithelial scales, and a purulent secretion which appears in the urine or in the irrigating fluid in the form of threads or filaments. The fluid is also rendered turbid.

In treating the posterior urethra we cannot avoid treating the bladder as well. A posterior urethritis may exist without being manifested by any subjective symptoms, but if these are present their severity bears no relation to the nature or extent of the pathologic changes. The posterior urethra must be examined as soon as possible.

After examining the anterior urethra with the urethroscope, it may be well to sound and catheterize the posterior urethra and the bladder. This exploration will reveal stronger infiltrations and painful spots. Slight bleeding caused by the introduction of a catheter is a symptom of superficial inflammation and loosening of the mucous membrane. The diagnosis must be based on the glass test, an examination of the prostate, and the urethroscopic findings.

It is advisable to treat the posterior urethra for some time with dilatations and irrigations before urethroscopy is attempted. Bleeding is then much less likely to interfere with an accurate examination. The treatment of the posterior urethra should be commenced at the same time as the treatment of the anterior urethra. In fact, it is perhaps best in every case to treat the entire urethra and bladder. A contraindication to instrumental treatment of the urethra is an acute in-

flammation of the adnexa, such as prostatitis and epididymitis.

The dilatation of the posterior urethra is done mostly with instruments which dilate only with their curved portion. Oberlaender uses instruments that have the Guyon curve, while Kollmann prefers the Dittel curve. Both kinds appear to give good results, but the Guyon curve corresponds more nearly to the natural anatomic condition present.

Catheters or sounds with the same curve as a dilator may be used before the latter is introduced, in order to map out the course of the urethra. Kollmann and Oberlaender do not think it advisable to introduce several such instruments in one sitting, especially when there is disease of the adnexa. In order to produce special action on the colliculus, the dilator is depressed to nearly the horizontal line. If it is intended to dilate the membranous urethra, the instrument is raised to nearly an angle of 45 degrees. A more accurate localization can be obtained by palpating through the perineum and rectum.

The first dilatation should be done carefully, especially if an acute inflammation has just subsided, or if the introduction of the instrument causes pain. Observe the expression on the patient's face while dilating, and stop at once if any suffering is occasioned. Cocainization of the posterior urethra prior to dilatation is not to be recommended, because it is not very effective in this region. The first dilatation should not be increased beyond twenty-five Charrière, and if the

introduction of the instrument was attended by pain, it is best not to dilate at all, simply allowing the instrument to remain in the urethra undilated for about five minutes. The same procedure is followed when there is reason to believe that the urethra has been injured by the introduction of the instrument.

The increase in the dilatations of the posterior urethra should be slow, especially at first. It is by no means necessary to increase the dilatation in each succeeding sitting. An increase of one number every second or third treatment usually is sufficient. The reactions are treated in exactly the same manner as was described in the case of the anterior urethra. Any increase in the quantity of the discharge is manifested by an increased cloudiness of the urine.

If separate dilatation of the anterior and posterior portions of the urethra is demanded, it is advisable to dilate the anterior urethra first and the posterior about four or five days afterward. In proper cases we may use dilators which dilate anteriorly as well as posteriorly. The isthums reacts very well to the dilatations. A four-branch dilator is better than one with only two or three branches. The action of the dilatations should be uniform in order to prevent the concentration of irritation in certain places. This is the surest way to prevent unexpected reactions. The healing of the posterior urethra takes place quickly in simple affections of the mucosa, but is comparatively slow in occurrence if the excretory ducts of the sexual glands are involved. A long course of treatment accompanied by relapses is

the rule in these cases. Even after the symptoms have disappeared the treatment should be continued in a mild form for some time.

The symptoms of an affection of the bladder tend to disappear early in the course of the treatment. When this does not occur, a careful search should be made for the causes of such obstinacy. Repeated careful cystoscopic examinations may reveal concretions in the bladder, tuberculosis, etc., or catheterization of the ureters will show the process to have extended to the ureters. As a rule, the prostate gland is the last part of the genitourinary tract to undergo healing.

Before beginning the treatment of a relapse, the affection must be localized carefully. The longer the time that elapses before the relapse makes its appearance, the more careful must we be in resuming graduated dilatation. Remember that the affection in the anterior urethra is the cause of a relapse in the posterior urethra.

TREATMENT OF HARD INFILTRATIONS OF THE THIRD DEGREE.

To this group belong all the hard infiltrations which after a few dilatations cannot be passed by a urethroscopic tube of No. 23 Charrière. The typical cases of this class show extended narrowing of the lumen of the urethra which is produced by the deeply penetrating, coarsely-formed infiltrations which resist absorption by dilatation.

The clinical picture of the hard infiltrations of the third degree is a varied one. In one person a strongly

developed stricture may occasion symptoms suggestive of a mild chronic gonorrhea, while in another there may be a continued discharge of pus, constant bladder trouble, retention of urine, and sexual neurasthenia. Neither the subjective nor the objective symptoms are such as to permit of drawing conclusions as to the severity of the pathologic lesions present.

In examining these cases it is often of value to note the condition of the urinary stream. It is, therefore, best to get the patient into the habit of urinating before each treatment. In strongly developed infiltrations the stream is thin, spiral in shape, and interrupted. This is especially true when the infiltrations are located in the anterior urethra. The examination is begun with a *bougie a boule*. It is sometimes necessary to try several sizes before one will pass all the strictures and enter the bladder. The *bougie a boule olivaire* produces the least injury, but the information gained is obtained only from the region of the strongest infiltrations. The introduction of conical metal sounds and catheters gives some information as to the hardness and resistance of the narrowest parts.

The urethrometer is of little diagnostic value in these cases. It does not give any more information than the *bougie a boule*, and its use is limited to the anterior urethra. The *bougie a boule*, on the other hand, searches the entire urethra. The exact condition of the lesions present can only be ascertained by means of urethroscopy when this is possible. The five-glass test is unreliable in these cases, on account of the narrowness of the ure-

thra, which causes the solution to flow into the bladder instead of allowing it to return to the meatus.

With the aid of the two-glass test, we usually are in a position to determine whether the bladder is affected. By means of cultures and the use of the miscroscope, we can determine the nature of the infection. A culture should always be made if the case reacts with fever and chills to the instrumental treatment. Some information may also be obtained by palpating the prostate, but the secretion expressed is usually prevented from appearing at the meatus by the narrowness of the urethra. The narrow parts may also make irrigation difficult, and internal medicines like salol and oil of sandalwood must be given instead.

℞ Olei santali, ... 3ij.
Salolis, ... 3j.
Ft. caps. xxiv, four to six a day.

In cases showing only a slight catarrhal infection and where complications are not apparent, the dilatation treatment is begun at once. In cases where caution is necessary, it is best to start the treatment with elastic conical bougies, introduced every third to eighth day, and left in place for from five to twenty-five minutes each time. Kollmann uses bougies filled with shot or fine lead filings, but these bougies cannot be obtained in sizes lower than No. 8 Charrière. When there is great narrowing of the urethra, he uses elastic bougies, with a zinc or a copper wire in the center. The French manufacturers quite recently put on the market silkworm gut in the very finest filiform bougies. The patient is always asked to

urinate before the instrument is introduced, and in severe cases irrigation with boric acid should precede the sounding.

The size of the bougie should be increased only after it has been resting loosely in the stricture for several treatments. It is not advisable to increase the dilatation beyond 20 Charrière with the elastic bougies, be caus if the patient has stood the previous treatments well, we can change to metal instruments at this number, or even sooner, without fear of producing an unexpected reaction. Conical metal catheters and sounds should be used in every case before the more active treatment with dilators is begun. The instrument should be well lubricated with a lubricant of solid consistency such as

℞ Saponis pulverisati, ... ℥vi.
Glycerini, Aquæ, āā., ... ℥iij.
Ac. carbolic pur., ... ♏vii.
(Guyon.)

The four anatomic obstructions met with in the posterior urethra are the (*bulbous sac*), the *colliculus seminalis*, the *internal sphincter*, and the posterior part of the *trigonum*. Any other obstruction to the introduction of an instrument than those mentioned is pathologic in origin. When trying to enter the narrow part of the urethra, the instrument should be guided along the normal course of the canal. It should not be moved from side to side in the attempt to find the natural opening, because it is not very likely that the entrance of the stricture will be found in this way. The end of the in-

strument may be pushed into an artificial pouch and a false passage made.

If these rules are observed, some pressure on the instrument is allowable. By withdrawing the instrument a little, one can ascertain whether it has entered the stricture. If not, a smaller instrument should be tried. If there is much bleeding, a day or two should be allowed to elapse before another attempt is made to pass the stricture. If there is retention of urine, it must be remembered that the passage could not have been closed completely at once, because urine passed through it some time previously.

Many of these cases are due to painful tenesmus. A warm bath of thirty to sixty minutes' duration and a morphine injection of $\frac{1}{6}$ to $\frac{1}{3}$ of a grain usually will give relief.

In order to remain informed as to the reaction to the treatment, the patient should visit the physician on the following day. If the stricture is an old and a narrow one, it is advisable to keep in touch with the patient for from six to eight hours, because during this time there is swelling of the mucous membrane and consequent retention of urine as the result of the dilatation. The parts which are particularly prone to swell are the meatus, the end of the bulbous sac and the membranous urethra. Dilatation of these parts must, therefore, be done with great care. The swelling will disappear spontaneously within from six to twenty-four hours.

In the case of strictures the reactions generally run a somewhat severer course than do the reactions

after the treatment of infiltrations of the first and second degree. Marked swelling in the latter after dilatation is usually a sign of too severe treatment, while in the infiltrations of the third degree swelling occurs regularly. The instrument used last in the preceding treatment is used first in the next, but in some cases it is necessary to begin with smaller sizes. The little success each time ought to satisfy the operator. By making haste slowly, as is sometimes said, we have less need to fear the onset of complications and the more certain will be the ultimate success.

Slight bleeding cannot be prevented in this method of treatment without lessening the beneficial effect. It is advisable to have the patient stay in the office for a quarter to half an hour after each treatment, so that we may watch the immediate effect of the treatment. The patient should be made to take as much rest as possible, and be cautioned against exertions of any kind. If we do not succeed in passing all the strictures, after a certain number of attempts, and enter the bladder, further treatment should be deferred for several weeks. In urgent cases surgical intervention must be employed, but repeated and careful attempts with the method described above will usually prove successful and give far better results in the end than can be obtained from surgery. In the intervals between the treatments the patient is directed to take warm sitz baths once or twice a day, for forty-five to sixty minutes each time. These baths seem to influence the hardness of the infiltration favorably. The greatest difficulties are overcome as

soon as we succeed in reaching the bladder. The bougie is to be withdrawn slowly, the penis being pushed back as far as possible at the same time. Irrigation with boric acid or weak potassium permanganate solution should be commenced as soon as possible, especially when definite catarrhal conditions are present.

The reaction should be watched carefully. The instrumental treatment should not be repeated until the reaction has run its course, which generally takes place in from three to fourteen days. Crowding or forcing the instrumental treatment produces new spots of inflammation and increases the severity of existing inflammatory areas.

If there is a discharge from the anterior urethra, injections of a 1 to 2 per cent. solution of zinc sulphate and alum are indicated. Balsamics may be given to aid in reducing the catarrhal condition of the bladder. Turbidity of the urine due to bacteria is best treated with hexamethylenamin (urotropin). The more inelastic the instrument used in dilating the stricture, the smaller should be its size and the less pressure is required to obtain a reaction. The most elastic and serviceable instruments are the hollow bougies. Next in order are the filled bougies and, finally, come the metal sounds and dilators.

If reasons exist for taking special precautions the dilator should be introduced but not opened at the first visit. If this treatment has produced the desired results, dilatation of one to two numbers may be done at the second visit. This dilatation should not be repeated

oftener than once a week. The more apparent the purulent nature of the case is, the longer should be the interval between dilatations and the shorter should be the time the dilator is allowed to remain in the urethra. The post-operative swelling should disappear within forty-eight hours. The discharge should not be increased essentially by the dilatation, and the urinary stream ought to show a steady improvement. This method of treatment consumes considerable time, but by this means the hardest infiltrations may be absorbed.

A condition designated as instrumental fatigue sometimes occurs in the case of nervous and irritable patients. The treatment should be discontinued at once, and not resumed for a month or two. When the treatment is taken up again, it must be very mild. No rules can be laid down as to the limits to which the dilatations may be pushed. In general, it may be said that we should dilate until we have a healthy surface. In catarrh of the bladder, in bacteriuria, in affections of the pelvis of the kidney and in the case of partial or total retention of the urine the injuries incident to the dilatation may be very severe. There may be chills and fever and an increase in the local inflammatory conditions. When the patient has a weak heart, the result of a chronic nephritis, one injudicious treatment may prove fatal. If the urine has always been clear, and if the general health of the patient is good, a dilatation which draws a few drops of blood need cause no apprehension.

Callosities also yield to the dilatations if they are

acted on by the instrument, but if they get between the branches of the dilator, the dilatation will affect the healthy tissue only. This occurs most often in the bulbous end of the urethra. If the callosities are arranged circularly, resistance is felt on dilatation, and if force is used, the dilator will break.

Even with great patience it may be impossible to increase the dilatation beyond a certain number. Internal urethrotomy is indicated when the callosities are located in the anterior urethra, but the posterior urethra should never be treated in this way. The best instrument with which to accomplish this purpose is the old two-branched urethrotome devised by Otis (Fig. 26). It has the disadvantage, however, that the part to be incised must be determined by measurement, a very unreliable method because the length of the urethra varies according to the blood supply of the tissues surrounding it. Therefore, the incisions are not always made in the proper place.

Kollmann's urethrotome (Fig. 47) consists of a metal *bougie a boule* with exchangeable heads of different sizes. By means of an arrangement on the handle of the instrument a knife can be thrown out at the height of the head. After having chosen a head which will pass the stricture, the instrument is introduced and under the guidance of palpation its head is passed just beyond the stricture. The knife is thrown out and with a quick movement the stricture is cut. The narrowest stricture that can be cut with this instrument is No. 18 Charrière. An elastic filiform bougie can

be fastened to the head for the purpose of passing through narrow strictures. The incision should be made in the middle line of the superior wall, because if made in any other place considerable bleeding may follow.

FIG. 47.

The urethra should be irrigated before and after making the incision. The bleeding may be controlled easily, if the incision is not too deep, by applying a compression bandage to the pendulous urethra. The bandage is removed by the patient just before the next micturition. There is then no more bleeding and the bandage need not be applied again. Kollmann always uses this ambulant treatment and has not had any accidents as yet.

After the urethrotomy the urethra is kept patent by sounds passed once or twice every week at first, and every month later on. After passing the colliculus a metal instrument ought to slip into the bladder almost by its own weight. Sometimes there are infiltrations or callosities just in front of the internal sphincter which obstruct the passage of the instrument. In such cases elevate the handle of the instrument a little, and without using force

introduce the instrument again until the obstruction is met.

The diagnosis of the presence of callosities can usually be made in this way, although we may have to do with a tonic contraction of the surrounding muscles. This may be overcome at the next treatment if the patient's bowels are thoroughly evacuated and a warm sitz bath of at least one-half hour's duration is ordered to be taken just before coming for the next treatment. A cocaine suppository in the rectum or cocainization of the posterior urethra may also aid in overcoming the spasm of the muscles.

In strictures such as those mentioned it is impossible to enter the bladder with a metal instrument, but this may be accomplished by means of an elastic bougie. The graduated dilatations may be begun with elastic instruments. The narrowing that is caused by callosities usually is not accompanied by any other inflammatory condition of the urethra. The callosities, as a rule, are the sequelæ of an acute posterior gonorrhea which did not become chronic, but formed abscesses. If instrumental treatment is begun soon after the acute stage has passed, callous formation may be prevented.

In some instances it may be difficult to differentiate between callosities and a large prostatic sinus of Dittel, the latter being considered a normal obstruction. If the obstruction can be passed by means of an elastic catheter, with a single or a double Mercier curve or with a metal instrument, using Hey's movement, it is not a callosity. In obstinate cases an external urethrotomy

must be done and the callosities excised. However, the results of such a procedure are not always gratifying, because excision of the diseased parts of the urethral wall will not dispense with the necessity of graduated dilatations. A stricture can only be absorbed when it still contains tissue that will react to the action of the graduated dilatations. Fibrous connective tissues react with difficulty only.

PAPILLOMATOUS URETHRITIS.

In disease conditions, the urethra may contain papillomatous growths which correspond histologically to the warts found on the prepuce. They occur either singly or in groups in any portion of the urethra, but particularly in the middle of the cavernous urethra. These warts usually are caused by gonorrheal infection, although Kollmann and Oberlaender have seen cases where gonorrhea could be excluded as a cause. When the *fossa navicularis* contains a papillomatous growth, warts will usually be found also on the meatus and the prepuce. The warts in the urethra can be recognized readily by means of the urethroscope and it is impossible to mistake them for anything else. Each wart protrudes prominently into the lumen of the urethra. The color of the urethral mucous membrane varies from a rose-red to a deep red. If the warts occur in groups, a smeary smegma-like substance is found between the papillomata. After removal of these growths, the supporting tissues suffer a pronounced

glandular infiltration which, under certain conditions, leads to the production of strictures.

These cases are usually discovered accidentally while making a urethroscopic examination. They do not manifest themselves clinically by any very pronounced symptoms, sometimes none at all other than those characteristic of a slight chronic gonorrhea. If these warts occur in large groups, subjective symptoms may be present and, particularly, disturbances on urination.

According to Oberlaender, these papillomatous growths are not met with as often now as formerly. The irrigations and dilatations given in the course of treatment of a case of gonorrhea deprive the warts of nutrition, they decrease in size, and sometimes fall off from the mucous membrane without any special treatment. In the more obstinate cases they are removed after having been brought into view with the urethroscope in the following manner:

Two pledgets of cotton on applicators are introduced up to the papillomata. The urethroscopic tube is then withdrawn, the two cotton tampons being left *in situ*. They are brought opposite each other in the region of the growth, and moved together to and fro and to the side of the attachment of the warts.

The urethroscopic tube should be of a size as large as the caliber of the urethra will permit, and the tampons should be just large enough to pass each other in the urethroscopic tube. The penis must be well stretched in order to prevent the formation of transverse folds. These movements either separate or loose the attach-

ments of the warts, and it will be noted immediately after the treatment or on the following day that a large number of the papillomata have been rubbed off.

It may be necessary to repeat this procedure several times. The interval between the treatments should be at least one week long. Of assistance in the removal of these growths is powdering them with resorcin, 10 per cent., and gum arabic, 90 per cent.

The excrescences may also be cut off with the edge of the urethroscopic tube. This is usually successful in the first sitting in the case of the smaller papillomata. The larger ones may require two or three treatments before they fall off. The very obstinate papillomata can be removed with Gruenfeld's cold wire snare or with Dittel's endo urethral forceps. Any remaining stumps may be treated with the blunt galvano-cautery. Papillomata are found in long-standing soft or slightly hard infiltrations. These operative procedures are applicable to papillomata situated in the anterior as well as those in the posterior urethra. Papillomatous growths situated near the excretory ducts of the sexual glands must be removed carefully and without injuring the neighboring structures, because of the possibility of extension of the inflammation taking place. Papillomata situated near the external meatus can sometimes be reached with the scissors or the ordinary cautery.

CHAPTER X.

BACTERIURIA AND NON-GONORRHEAL URETHRITIS.

This condition is the condition in which freshly voided non-purulent urine is made turbid by the presence of numerous microorganisms. It occurs in infectious diseases other than those of the genitourinary tract, but inasmuch as it usually accompanies a chronic gonorrhea, it is mentioned in this connection.

The treatment consists in the administration of urinary antiseptics, urotropin gr. $7\frac{1}{2}$, t.i.d., and in regulation of the bowels. Habitual constipation is often the direct cause of colonbacilluria. If the cause of the bacteriuria is located in the lower urinary passages, irrigations with potassium permanganate may be of service. A faultless technic is absolutely necessary if we would not run the risk of producing a septicemia or a pyemia, which might terminate fatally, especially in the case of older patients.

CHRONIC NON-GONORRHEAL URETHRITIS.

This affection stands closest to the soft gonorrheal infiltrations. Walsch mentions as characteristic of these cases long periods of incubation; chronicity from the beginning; causing the patient little inconvenience,

the gonococcus always absent, and in spite of proper treatment healing does not take place. Reichmann found hyperemia and granulations affecting especially the posterior urethra. He destroyed these granulations with the galvano-cautery, stopped the secretion but failed to obtain any healing.

I have obtained satisfactory results in one case by a combination of the regular antiseptic and congestive treatment with vaccination therapy under guidance of the opsonic index.*

*The determination of the opsonic index were made by Dr. Fischer at the Columbus Medical Laboratories.

CHAPTER XI.

GONORRHEAL PROSTATITIS.

Prostatitis is the most important and the most frequent complication of gonorrhea. In most cases of posterior gonorrhea the gonococci find their way through the prostatic ducts to the gland. They usually perish there without producing an inflammation. Goldberg thinks that the prostate gland secretes a substance which under normal conditions confers immunity to gonorrhea on the gland cells. Infection will occur, however, under certain conditions, as in the case of masturbators, bicyclists, equestrians, and in persons who are given to carousing, and excesses in general. Such individuals are the victims of long-continued hyperemic conditions and irritations of the prostate gland, and offer a favorable soil for the growth of the gonococcus. It is not clear why in one case we will have an acute abscess with inflammation, and in the other a subacute or chronic catarrhal inflammation.

Prostatitis is a complication in sixty to seventy-five per cent. of all cases of chronic gonorrhea. It most often accompanies the hard infiltrations of the first and second degree, less frequently the soft infiltrations, and seldom the infiltrations of the third degree. Two principal forms can be distinguished, the super-

ficial desquamative process, which is limited to the excretory ducts of the glands, and a deep, suppurative process, which affects the glands themselves.

The latter is more common than the former. Oberlaender is of the opinion that usually only one portion of the gland is affected at a time, and that the inflammation spreads to the other portions gradually, the part first affected going on to healing in the meantime.

The diagnosis is not always easy. The most valuable information usually is obtained by rectal palpation. The normal prostate is of variable form and size. A large prostate does not necessarily mean a diseased gland, but if both lobes show an essential difference in size, the condition usually is a pathological one. If, in addition to this, palpation reveals distinctly painful spots in one or the other lobe, then there can be no question of inflammatory changes. The consistence of the normal gland is variable. In some cases it is firm and hard, in others soft and elastic, and in still others it is doughy. The latter condition should always excite the suspicion of the gathering of abnormal secretions. The consistency of the gland, therefore, is not an indication of any pathologic condition. Oberlaender often found tightly stretched and uniformly hard glands combined with a purulent secretion. It is usually possible by means of rectal massage of the prostate to express its secretion, which will appear at the meatus in the form of drops or large masses. If no secretion appears at the meatus, the urethra may be emptied by massaging, beginning at the bulb and proceeding to

the glans. The patient should always urinate before the massage is begun, in order to prevent the admixture of the urethral and prostatic secretions, which would make the examination less reliable. When no secretion appears at the meatus even after massaging the urethra, it is well to have the patient void only a part of the urine before the treatment and the remainder after the treatment, thus washing out the expressed secretion which is in the urethra. The urine containing the prostatic secretion is centrifugated and the sediment examined microscopically. More accurate results can be obtained if the urethra and the bladder are irrigated before and after massage. Boric acid or physiologic salt solution are most suitable for this purpose. The pathologic secretion can be recognized microscopically according to Goldberg, as follows: A drop of normal secretion placed on a glass plate appears as a uniformly milky fluid, while the abnormal secretion appears as an incomplete emulsion only. Schlagintweit describes the following macroscopic test. The patient is made to place his meatus over a glass of water while the operator massages the prostate. The prostatic secretion dropping into the glass is dissolved by the water and imparts to it an opalescence; while the pus falls to the bottom of the glass. The contents of the seminal vesicles (expressed secretion of the upper part of the prostate) does not dissolve. The secretion sinks slowly to the bottom of the glass, leaving a trail behind it in the form of a column, which connects the drop with the surface of the liquid.

The most reliable aid in diagnosis is the microscope. The normal secretion of the prostate consists of masses of lecithin granules and some glandular epithelial cells (Fig. 48). The spermatic crystals and the amyloid corpuscles are not constant ingredients of the prostatic secretion. The presence of spermatozoa in the secretion usually means an involvement of the seminal vesicle and ejaculatory ducts in the inflammatory process.

FIG. 48.—Microscopical appearance of the semen (human) eye-piece III., objective 8A, *Reichert*. *a*. Spermatozoa; *b*. Columnar epithelium cells; *c*. Bodies enclosing lecithin granules; *d*. Squamous epithelium cells from the urethra; *d*. Testicle cells; *e*. Amyloid corpuscles; *f*. Spermatic crystals; *g*. Hyaline globules. (*von Jaksch*.)

The symptoms of gonorrheal prostatitis are extremely variable and not infrequently a typical purulent prostatitis will run its course without being recognized. The symptoms are either trifling and so insignificant that the patient pays no attention to them, or they manifest themselves in the form of a sexual neurasthenia which often is not looked on as being in any way connected with the prostatitis or the gonorrhea. It is often very difficult to make such patients understand that their nervous affection cannot be cured as long as the treatment of its cause is neglected.

The prostate gland is situated at the crossing of three tracts, the urinary, the genital, and the intestinal. Considering for a moment the anatomic and physiologic relation of the prostate to other organs will make it apparent that disturbances due to inflammation of this structure give rise to a symptom-complex variable in nature and depending on the extent to which one or the other tract is involved in the disease process. The symptoms may be referable to the urinary, the sexual or the digestive tract, and the tract itself may manifest symptoms of either motor, sensory, or secretory disturbances. Exhaustion or depression in one tract may be accompanied by over stimulation or irritation in another. It is therefore almost impossible to enumerate all the symptoms of a prostatitis.

The patient may suffer from frequent nocturnal erections and premature ejaculations, with partial or complete sexual impotence. There may also be present disagreeable sensations during and after urination. The frequency of urination is usually increased. Other disturbances appear to be purely local in character and nervous in origin, such as pain in the testis, pain along the course of the spermatic cord, accompanied by pain on the inner side of the thigh and pain above the symphysis; pain in the loin, either constant or only after defecation, compression and lasting pain of the anus. As disorders of a nervous character may be mentioned constipation, pain in the abdomen and along the spine, headache, a feeling of tire of the body with utter fatigue of the limbs, psychologic depression, pain referred to the

piles, pains like those met with in epididymitis and inflammation of the spermatic cord. As in the case of gonorrhea of the urethra, the severity of the pathologic lesion must not be judged or measured by the degree of severity of the subjective symptoms.

Prostatorrhea and spermatorrhea are almost constant objective symptoms. If the gland secretes strongly, and if the urethra is small in caliber, with few folds, there may be present a transient or constant discharge of prostatic secretion which is usually mixed with spermatic fluid. The cases met with most often are those in which the secretion is pressed out during micturition or defecation (prostatorrhea and spermatorrhea), or the secretion may appear in the form of filaments in the urine. It is difficult to differentiate between prostatitis and vesiculitis.

The differential diagnosis between chronic gonorrhea of the urethra and the gonorrheal infection of the prostate cannot always be made. The secretions may intermingle or the prostatic secretion flows into the bladder, producing a turbid, purulent urine, or a clear urine, containing filaments.

It is not uncommon to have a strong purulent flow containing gonococci in great numbers during the course of a prostatitis. In such cases the cause is usually the rupture of an encapsulated prostatic abscess. Under suitable treatment, such as massage of the prostate and irrigation of the urethra and bladder, the gonococci disappear in a few days. The pus thins out and becomes less in quantity, until after about nine or ten days the

urethra is dry and the urine clear. A urethroscopic examination at this time may not reveal any changes in the mucous membrane.

If the purulent prostatic discharge flows into the bladder, a clear urine will suddenly become turbid. With the aid of rectal palpation it is sometimes possible to discover the cavity of the abscess. Pressure with the finger will force the remaining pus into the urethra. In most cases the pus is blood-stained, and cases are observed where pure blood is discharged after micturition.

Prostatitis and posterior urethritis must always be taken into consideration as possible causes of hematuria. Prostatitis may also be the cause of a bacteriuria. The prostatic bacteriuria yields promptly to massage and irrigation, but renal bacteriuria does not.

Phosphaturia appears as a symptom of prostatitis in a considerable number of cases. The color of the urine varies from a light green shade to a milky turbidity. The addition of acetic acid clears the urine and brings the gonorrheal filaments into view. The presence of filaments is a valuable symptom in the differential diagnosis of "essential phosphaturia." Phosphate of calcium mixed with smaller or larger quantities of carbonate of calcium sometimes is seen in prostatic phosphaturia in the form of whitish crumbling masses at the end of urination or in the last portion of urine voided. The discharge is usually accompanied by a burning spasmodic pain at the neck of the bladder.

The causes of phosphaturia in this affection are the

alkaline decomposition of the urine, the vegetable diet, and alkalies contained in the medicines. The condition disappears with the healing of the underlying affection. Albuminuria in connection with prostatitis, with an absence of large amounts of pus or of spermatozoa, usually is traumatic in origin and transitorv in character.

The differential diagnosis from senile hypertrophy of the prostate is aided by the age of the patient, the presence of recidual urine, and, perhaps, by the absence of pus in the expressed secretion. In advanced hypertrophy, when the catheter must be used constantly, the prostate is congested and the disturbances caused thereby are very similar to those of a gonorrheal infection.

The differential diagnosis from tuberculosis of the prostate is very difficult at first, and can only be made by finding the tubercle bacilli. In tuberculosis, the urine does not clear up with irrigations of nitrate of silver; in fact, the condition is sometimes made worse rather than better. The same is true of massage and dilatations.

The prognosis of gonorrheal prostatitis depends in a measure on the course and healing of the coexisting gonorrhea. As long as the gonorrhea is not cured, a healing of the affection of the prostate cannot be expected, on account of the constant reinfection from the urethra.

The time required to cure a case of prostatitis varies from several months to several years. It is best to

continue the treatments for two or three months, and then suspend them for a month or two at first, and three or four months later on. The treatments should always be mild.

Gonococci are not always found readily in this affection. Nötthaft found that one-fourth of all cases of prostatitis show evidences of secondary infection within the second half of the first year. He mentions the following germs found in cases of secondary infection in the order of their frequency: (1) Staphylococci; (2) diplococci, staining by Gram's method; (3) bacilli; (4) streptococci; (5) unidentified bacteria.

These mixed infections complicate the treatment and make the prognosis uncertain. Chills and high fever may occur in these cases, without apparent cause, or in response to slight irritation of the urethra by instrumental or even medicinal treatment. They may be present irregularly for weeks or even months. In severe cases the outcome may be a fatal one. The attacks are best treated by means of hot applications to the abdomen. They dispel the pain by producing an increase in the congestive hyperemia and promoting the gathering of pus into abscesses. Urinary antiseptics should be given internally, but we must not expect too much from them.

As a rule, the abscesses rupture spontaneously into the urethra, less often into the rectum. If an abscess fails to rupture, and if the patient's condition is poor by reason of the intoxication, it is advisable to evacuate the abscess by perineal—pre-rectal—incision. It is not

advisable to open the abscess through the rectum even when rupture of the abscess in that direction is imminent.

Post-mortem examinations have shown that sometimes the entire prostate gland is converted into an abscess, which is encapsulated, without giving rise to any symptoms. On the other hand, such an abscess may be the cause of a pyemia which appears suddenly, and results fatally, without a diagnosis of the cause of death having been made.

In the treatment of this affection it is well to remember that the immediate cause of the infection was a posterior urethritis, and that the microorganisms entered the gland through the prostatic ducts. Therefore, treatment should first be directed to the portal of entrance of the infection.

In the acute stage, the treatment consists in irrigations only, while in the chronic stage it consists of irrigations and dilatations. The graduated dilatations first absorb the infiltrations around the ducts, next those in the interior of the gland. Instruments with Guyon's curve should be used in preference to those having a Dittel's curve.

The inflammations of the prostate and those of the bulb have many points in common. In both affections inflammation involves the deeper tissues so that they are not easily acted on by the dilatations. These foci of infiltration are resistant to treatment, and display a tendency to spread toward the urethra and, under certain conditions, to produce exacerbations.

Irrigations and dilatations are conducted according to the same rules as in affections of the urethra. Dilatations are made every ten to fourteen days, irrigations every day or every other day, and massage of the prostate once or twice a week. The progress of an uneventful healing is best judged by the changes in the urine. This is clearing up and the filaments become more and more apparent. At first, they are long and thick and opaque, and later, and as healing progresses, they become shorter and thinner and transparent.

After each dilatation there is a characteristic change in the filaments. They appear in larger numbers, but are smaller in size and more friable in nature. In the course of a few days they are replaced gradually by a smaller number of larger filaments. Later in the course of the treatment the filaments are absent for longer or shorter periods of time. The filaments consist mostly of large round cells. Sometimes globules looking like fat droplets are seen in the cell body and sometimes free in the urine (hyaline globules).

Healing does not always proceed as smoothly as has just been described. Relapses are the rule rather than the exception in the course of healing of prostatitis. If a relapse occurs, the dilatation must be commenced again, starting with a low number.

The treatment of a reaction is identical with the treatment of the urethra. Potassium permanganate is used first and then sulphate of zinc and nitrate of silver in gradually increasing strengths. If the patient cannot bear the nitrate of silver solution, or if the

urine does not clear up under its use, the zinc sulphate or potassium permanganate must be substituted. After several weeks the silver nitrate may again be tried.

An instrument of value in the intraurethral treatment of prostatitis is the cooling sound or cooling catheter of Winternitz (Fig. 49). It consists of a double-barreled catheter closed at its upper end. The catheter is introduced into the urethra and from five to seven liters of water, of proper temperature, are allowed to flow through it from a height of about one meter. This relieves the symptoms of irritation that accompany chronic gonorrhea and prostatitis and the so-called

FIG. 49.—Cooling catheter of Winternitz.

post-gonorrheal disturbances. Its use is contraindicated in the acute affections of the urethra or of its adnexa, in bacteriuria, and in suppurative conditions of long standing. The temperature of the water used should be 15° to 20° Celsius at the first treatment, and lowered gradually in subsequent sittings. The instrument is removed as soon as the patient complains of cold sensations. The length of time the instrument is left in the urethra varies from 10 to 20 minutes. The treatment is repeated two or at most three times a week. It is beneficial in spermatorrhea, and prostatorrhea, and

particularly in nocturnal emissions and in partial or total sexual impotence due to prostatitis.

Warm or hot sounds can be used with benefit in all painful conditions of chronic prostatitis. The temperature of the water used should be about 40° to 45° Celsius. Each treatment is of from ten to twenty minutes' duration, and may be preceded by rectal massage. It can be repeated two or four times a week.

Treatment may also be carried out through the rectum, although only the peripheral portions of the gland are influenced. The treatment consists of massage and drugs administered in the form of suppositories. The massage is the more important of the two. It is carried out best with the protected index finger and is to be preferred to massage done with an instrument in susceptible cases and where the point of the finger can reach the upper border of the lobes.

Massage is very disagreeable to some patients, on account of the pain caused by the palpation of the gland, and in consequence of the stretching of the anal and rectal sphincters. Reflex contraction of these muscles may even make massage impossible. The action of the massage is not confined to the emptying of the gland of its pathologic secretion. It also improves the circulation of the gland.

The massage is performed with the patient either in the recumbent or in the bent upright posture. The folds of the anus are well spread apart before the finger is introduced into the rectum in order to avoid pressing on hemorrhoidal nodes when these are present. If

these nodes are acutely inflamed, the examination and treatment should be postponed and the hemorrhoids treated first.

The first structure felt after passing the anal ring is the membranous urethra. It is located in the middle line toward the front. Higher up and to the right and left of the middle line are the lobes of the prostate gland. On the upper border of the prostate, toward the outer side of each lobe, can be palpated a shallow recess, the seminal vesicles. The fundus of the bladder can be felt in the middle line between the seminal vesicles. The movements of the massage are made from the border of the gland towards its middle, and consist of from four to eight rubbing, kneading and pressing movements. The kneading movements are made with the tip of the finger; the pressing movement with the whole finger. All these movements are made slowly. When the prostate is tender, these movements must be very gentle. Painful spots must be looked for and their position noted. Besides the finger, especially devised instruments are used for this purpose. The use of these instruments is indicated in the case of patients who have a strongly developed panniculus adiposus of the buttock. In these cases the finger is introduced with difficulty.

The instrument is also used when the prostate is located high up, so that it cannot be reached with the finger. A very serviceable instrument for this purpose is the one described by Feleki (Fig. 50). Massage of the prostate should always be done by the beginner

with the finger before using an instrument. The result of the first massage often is only a little or no pus at all even when the symptoms present indicate an in-

FIG. 50. — Feleki's massage instrument.

FIG. 51. — Schoenfeld psychrophore.

fected prostate. In these cases the diagnosis is usually confirmed by the second or third massage, when a distinct purulent discharge makes its appearance.

When the patient is predisposed to develop epididymitis, the massage should be done very gently and carefully and at longer intervals. The region of the seminal vesicles should not be massaged at all. In these cases we may be forced to limit the treatment to the application of drugs to the rectum In uncomplicated cases prostatic massage should be given two or three times weekly. The patient should feel better after each treatment. The Schoenfeld prostatic psychrophore (Fig. 51) is used with great benefit in some cases of acute and chronic prostatitis. With this instrument we can apply heat or cold in the same treatment by turning the cock at the proximal end of the instrument.

Another very active means of treating these prostatic disturbances is the ichthyol injection first used by Scharff. Five grams of a five to ten per cent. solution are applied to the rectum above the prostate. The injection is best made just before the patient retires for the night. In some patients the application causes tenesmus and then it must be either temporarily or permanently discontinued. If there is no apparent improvement after two or three weeks of continued use of the ichthyol injections, they must be discontinued. If improvement continues, the injections may be continued for one or two months.

CHAPTER XII.

GONORRHEAL EPIDIDYMITIS.

Although we are concerned only in the discussion of that form of epididymitis which is a complication of gonorrhea, we will at this time mention briefly the other varieties.

Acute epididymitis can be divided into a traumatic, a metastatic, and a urethral form. The traumatic form occurs after forced exercise of the abdominal muscles, such as takes place during heavy lifting, jumping, and the playing of wind instruments. It also occurs in equestrians, bicyclists, boxers and wrestlers, when it is due to contusions. The metastatic form occurs during acute infectious diseases, such as mumps, influenza and typhoid fever, but it does not accompany these affections as often as does orchitis.

The urethral form of epididymitis is the most important of the three. It is caused by an irritation of the urethra which enters the epididymis by way of the vas deferens. Inflammation of the vas deferens, to the extent of being manifested clinically, is not a necessary concomitant. The microorganisms were deposited either on the healthy mucous membrane of the urethra at the same time that the irritation occurred, or previously, as is the case in a posterior gonorrheal

urethritis. The last-named condition is the cause of the most important and also the most frequent form of epididymitis. As immediate causes may be mentioned venereal and other excesses, habitual sexual excitement, exertions incident to walking, riding, dancing and bicycle riding, and occasionally the instrumental treatment of chronic gonorrhea, although this may by no means be the fault of the operator.

Epididymitis may follow prostatic massage. The etiologic connection between the two is evident, even though previous massage was not followed by this complication. Other conditions which predispose to the production of epididymitis are excessive urethral secretion, spermatorrhea, chronic inflammations of the ejaculatory ducts, and of the vas deferens. Some patients exhibit an inclination to relapses a long time after the first inflammation has run its course, without apparent cause, without instrumental intervention, and without previous massage of the prostate, an epididymitis appears, even after the lapse of months following an apparent cure. It must be assumed that the gonococci have lain dormant in the tissues of the adnexa and that as the result of some alterations in the culture media the conditions for growth again became favorable.

The epididymitis of an acute gonorrhea usually is sudden in onset. The patient says that he first had a sensation as of a drop of hot water falling on the scrotum, and that this was followed immediately by pain and in the course of a few hours swelling of the epididy-

mis. The epididymitis that follows a chronic gonorrhea is usually gradual in onset and less stormy in its course. The first symptom may be pain on pressure on the epididymis, and a feeling of weight in the testis. On the other hand, chronic gonorrhea does not insure against the occurrence of a very severe inflammation of the epididymis, one which may be accompanied by chills and fever, vomiting and convulsions.

The course of an epididymitis may be divided into three stages, the progressive, the stationary, and the retrogressive, each stage enduring for three to eight days, according to the severity of the case. The severity of the symptoms varies with the intensity of the inflammation of the epididymis and the extent of involvement of the spermatic cord and the seminal vesicles. In severe cases there may be marked peritoneal irritation, high fever, and much pain referable to the affected parts.

TREATMENT.

The patient should be at rest, in bed. The ambulant treatment is not to be recommended, but it must be used when the patients are not willing or able to stop working. The treatment consists in the application of hot compresses, saturated with a one per cent. solution of acetate of aluminum. The compress is covered by a well-fitting suspensory. If the infiltration and pain increase in severity in spite of this treatment, rest must be insisted on.

The scrotum is elevated and hot or cold applications

are applied. Oberlaender and Kollmann prefer cold to heat. They cover the scrotum with an ice-bag, which is left in place both day and night at first, but later only in the daytime. This treatment is continued until palpation of the affected parts no longer produces pain. According to these authors, a change from cold to heat is indicated only when cramp-like pains are present, either in the epididymis or in the spermatic cord, or if some parts of the swelling remain painful for a long time, and if they convey the impression that pus is forming. It is rare indeed that abscess formation takes place in this condition, that is, to the extent of requiring surgical intervention.

The writer prefers to begin the treatment of epididymitis with the application of heat in the form of poultices, changing to cold if the pain and swelling do not disappear within a few days. After the cessation of the pain, and when the swelling is reduced, the patient may be allowed to move gradually. The application of moist compresses after the patient is in condition to leave his bed hastens complete absorption of the remaining infiltration. In the more obstinate cases ointments may be used instead of compresses. Oberlaender and Kollmann recommend the following formula:

℞ Unguentum hydrargyri, dil. (16½ %),.... 10 parts.
Extract. belladonnæ, ... 1 part.

A portion of this ointment of the size of a pea is rubbed in gently two or three times a day. This ointment is less irritating and less likely to produce an

artificial eczema than is iodine ointment, which is used very much, and gives fairly good results. If an eczematous condition is produced, the ointment should be discontinued at once, the scrotum cleansed thoroughly, and compresses applied again. The products of the inflammation are absorbed by this treatment. The induration at the head of the epididymis is usually the last to disappear.

In cases of bilateral epididymitis the patient should be informed that sexual impotence may follow the affection. Cases have been observed where, in spite of the bilateral induration, sterility was not produced.

During the course of the epididymitis, the treatment of the urethra and prostate should either be discontinued entirely, or continued in mild form only. The physician whose experience has been limited will do well to discontinue the treatment for at least fourteen days and then commencing it again in mild form. The irrigations should be resumed first, and then the instrumental treatment. If the epididymitis relapses, in spite of careful treatment, it is advisable to give the patient another rest for a month or two. The treatment when taken up again is limited to the anterior urethra, being extended to the posterior urethra later on, and finally to the prostate.

Chronic gonorrheal epididymitis is characterized by a connective tissue hyperplasia following the acute inflammation. There is produced a nodular enlargement of the epididymitis accompanied by contractions, compressions and even total obliteration of the lumen

of the epididymis. This newly formed tissue must, at first, have some circulation, and so long as this is present, the tissue will react to massage and congestive hyperemia. These pathological structures can usually be absorbed by conjestive hyperemia produced by constricting the base of the scrotum with the aid of an elastic band applied 3 to 12 hours daily. One or both testicles may be congested.

The elastic band should be well padded as the location can not be changed and irritation of the underlying skin is likely to occur. The constriction should be just tight enough not to feel uncomfortable. But at the same time, the underlying disease, the posterior urethritis and the vesiculitis must receive attention and appropriate treatment. For more detailed information on this subject the reader is directed to Zabludowski's work on Technik der Massage, Leipzig, 1903, and Bier's book, Hyperæmia als Heilmittel, Leipzig, 1907.

Gonorrheal orchitis without epididymitis occurs very seldom, and the subjective symptoms, the course, and the treatment are practically identical with those of epididymitis, which see.

CHAPTER XIII.

GONORRHEAL INFLAMMATIONS OF THE SEMINAL VESICLES.

Inflammation of the seminal vesicles is usually accompanied by prostatitis and posterior gonorrhea. Almost every symptom of vesiculitis can, under certain conditions, also appear in the affections just named. It is therefore almost impossible to make an absolute diagnosis. If pollutions form a prominent symptom, and if these are followed by a tired feeling and a depressing weakness, it may be taken as evidence of the involvement of the seminal vesicles. Although pain usually is not a prominent symptom of vesiculitis, some patients complain bitterly of disagreeable sensations and even severe pain, either immediately after the emission or on the following day. Pain in the back and painful spasms at the neck of the bladder are common symptoms. The pollutions may be purulent or sanguineous in character, and the color may vary from a grayish-yellow to a chocolate-brown.

The microscopic examination shows either no spermatozoa at all, or only immotile ones, red corpuscles, leucocytes and tissue debris.

The treatment consists in curing the underlying disease, the posterior urethritis and prostatitis, especially

the latter. Belfield* has obtained good results in the treatment of purulent affections of the seminal vesicles from irrigations and drainage of the seminal duct through the vas deferens.

INFLAMMATIONS OF COWPER'S GLAND.

This is a rare complication of gonorrhea, and according to English it is to be regarded as suspicious of tuberculosis. When it does occur it is manifested as a painful, usually unilateral swelling, below the bulb. The swelling may be so marked as to compress the urethra and cause urinary disturbances.

The treatment of this condition consists in early incision and drainage. The abscess may rupture spontaneously into the urethra and give rise to a slowly healing fistula. As a rule, however, it opens externally and heals without any further complications. In order to prevent urinary infiltration after the spontaneous evacuation of the abscess into the urethra, it is well to keep a self-retaining catheter in the urethra for two or three days after the rupture has occurred.

According to M. v. Zeissl, suppuration of Cowper's gland is a frequent complication of croupous pneumonia.

*Chicago Medical Recorder, No. 11, 1906, p. 635.

CHAPTER XIV.

GONORRHEAL URETHRITIS IN THE FEMALE.

Acute gonorrheal urethritis in the female is usually of short duration, and it may run its course without being detected by the patient. In the examination of prostitutes it is by no means infrequent to have massage of the urethra through the vagina produce a discharge of greenish-yellow pus, the patient not having any subjective symptoms. The symptoms usually become prominent only when the posterior portion of the urethra or the internal orifice and the trigonum are affected.

For the protection of the patient, as well as that of her relations, sexual intercourse should be absolutely interdicted until the symptoms of infection have disappeared.

As to the diet, the same rules hold good, as given under the chapter on gonorrhea in men. Warm douches of bichloride of mercury, 1:1000 to 1:4000, should be given to the vulva several times a day; absorbent gauze containing iodoform or aristol should be put between the labia in the intervals. If pain and frequent urination are present, they are best relieved by warm hip baths, given at a temperature of 95° to 105°, and hot or cold compresses applied to the region of the vulva and the os pubis in the intervals.

The treatment of the urethritis proper is not as ur-

gent as in the male. The above-mentioned measures usually bring improvement, and even cure in a few days without any medical or instrumental treatment.

The medical treatment consists in the internal administration and local application of antiseptics. If the infection is a pure gonorrhea, the following prescription is of distinct value:

℞ Olei santali ost indici,
Ext. pichi Americi sicci, āā ..... ℥ij.
Massae pil. q. s. ut fiant pilul, No. 60. (Kollmann.)

If the infection is mixed, the following emulsion gives good service:

℞ Copaibæ, ... ℥iv.
Salol, ... ℥iii.
Mucilage acaciæ, q. s., ad., ... ℥iv.
℥j t. i. d.

The local application of antiseptics is best done with a blunt-pointed syringe of two-dram size.

As to prescriptions, see page 113.

Ricord recommends the following mixture:

℞ Zinc sulph., ... gr. x to xxx.
Plumb. acet. bas. sol., ... gr. xx to ℥j.
Tct. catechu, } āā ..... ℥j.
Tct. opii compos, }
Aq. distill., q. s., ad., ... ℥xii.
Inject three to four times a day.

The introduction of iodoform, argyrol or protargol pencils is of little value.

Kolischer has the pencils made without any wax because the latter substance is liable to produce concretions in the bladder.

The chronic gonorrheal urethritis does not necessarily manifest itself by distinct clinical symptoms. The diagnosis may, therefore, be dependent to a large extent on the urethroscopic and cystoscopic findings. According to Kolischer, Oberlaender and Bumm, the chronic gonorrhea of the female urethra is represented by a soft infiltration only. Hard strictures producing infiltrations as we find them in men do not occur. The urethroscope shows, situated on the chronic inflamed mucosa, individual patches, round or oblong in shape, measuring about one centimeter in diameter. They have a velvety, swollen appearance. Their surfaces show granulations and small papillomatous excrescences which bleed easily when touched with the urethroscopic tube.

The lips of the external urethral orifice often have a glassy look, and solitary follicular swellings and sometimes little abscesses are found within their boundaries. Secretion cannot always be pressed out, even after long intervals of urination. In some cases we find hypertrophic masses around and within the lips of the meatus. These structures were first described by Oberlaender. They are pathognomonic of gonorrhea, and are usually found only in prostitutes. In rare instances, according to Kollmann, they are found in the infected wife. They remain in the same condition for a long time, even after the gonorrhea has disappeared.

The internal urethral orifice is often attacked by the gonorrheal infection and it then appears red and swollen. The infected trigonum is also swollen and usually of a deep red color.

The bladder must be emptied before the urethroscopic tube is inserted, and tampons must be used freely after the tube is inserted, in order to prevent clouding of its surface by the steam forming around the lamp.

Chronic affections of the urethra and bladder other than those of gonorrheal origin occur oftener in the female than in the male. The clinical symptoms are more uncertain in women than in men. Among the subjective symptoms may be mentioned tenesmus, pain on urination, a continuous sensation of burning at the external orifice, and a feeling of discomfort in the region of the bladder. Neither the intensity of the inflammation nor the severity of the pathologic process can be estimated by the prominence of the subjective symptoms. These seem to be more prominent during menstruation, when the diet is faulty, and when the patient is suffering from constipation.

The progonsis is good in simple gonorrhea, but less favorable in the mixed infections. Malposition of the uterus often is the cause of a disturbance of the bladder which may be diagnosed as gonorrhea. Slight catarrhal conditions may be present, but the characteristic urethroscopic and cystoscopic findings are absent. A differential diagnosis is not always possible at first, and several examinations may have to be made.

It must be borne in mind in this connection that gonorrhea and infections of the urethra which are believed to be gonorrheal extend more easily and oftener to the bladder, ureters, pelvis of the kidney and eventually to the kidneys themselves in the female

than in the male. Cystoscopic examination and ureteral catheterization should be done in every suspicious case.

The determination of the functional capacity of the kidneys may sometimes help to clear up an indefinite case. Furthermore, we must remember that the clinical symptoms of ureteritis and pyelitis often are not apparent. Our attention is directed to the disturbances on urination, and to various painful sensations in the region of the bladder, while an examination will disclose the urethra and bladder to be in a relatively healthy state or only slightly congested. The etiology and nature of such conditions is uncertain and puzzling, especially if the disease has existed for years. Exacerbations of ureteritis and pyelitis are characterized by the sudden appearance of turbid urine containing pus, and subjective symptoms pointing to involvement of the urethra and bladder.

TREATMENT.

Hexamethylenamin (urotropin) is very valuable in the mixed infections, but is absolutely without benefit in cases of simple gonorrhea. On the other hand, nitrate of silver irrigations are particularly beneficial in simple gonorrhea, but they are not well borne in the mixed infections. Graduated dilatations are indicated both in the simple and mixed infections, if the urethroscope reveals the changes in the mucosa that are typical of chronic gonorrhea.

A straight dilator with four branches is the most

suitable for this purpose, unless some severe inflammatory condition of the meatus demands the use of an instrument of smaller size. The average number with which to start the dilatation may be given as 25 Charrière. The use of a local anesthetic is recommended, at least at the beginning of the instrumental treatment. The dilatation should be stopped as soon as the patient complains of pain, and during the subsequent treatments the increase in the size of the instruments should be slow and careful. The reaction following each dilatation should be noted carefully. The meatus may be dilated up to 40 Charrière, if the dilatation is done gradually, and it is rarely necessary to go beyond that.

Before the specimen of the urine is taken for examination, it is best to irrigate the vagina first with a boric acid solution. Colonbacilluria is not a rare complication in these cases. The bowels should be regulated, and hexamethylenamin (urotropin) may be given continuously.

Relapses can be excluded in the female as little as in the male. The treatment must be discontinued during menstruation, and therefore the entire treatment consumes more time in the female than in the male. When the patient ceases to make satisfactory progress it is advisable to discontinue the treatment temporarily. It is often impossible to find a reason for this slow healing. Sometimes the objective symptoms improve while the subjective symptoms remain almost stationary. Psychologic and hysteric influences must always be considered.

The following rules must be observed when the in-

flammation has extended to the bladder, the ureters, or the pelvis of the kidneys. In ureteritis and pyelitis of gonorrheal origin, never fail to treat the underlying disease of the urethra and of the bladder. Only after this has been cured can we expect to arrest the process in the upper urinary organs. But the treatment must be mild. Any severe treatment, like rapid dilatations or frequently repeated irrigations with silver nitrate, must be avoided. Irritation of the lower urinary passages is referred reflexly to the upper diseased passages. In certain cases instrumental treatment and even irrigations must be discontinued on account of this reflex irritation.

The healing of the ureteritis and pyelitis is aided by the internal administration of hexamethylenamin (urotropin), oil of sandalwood, salosandal, and waters or teas, and by taking warm baths and hot half-baths. The diet should be regulated carefully, (see page 111). The body should have good general care, and the patient should rest as much as possible. In affections of the bladder curved dilators should be used instead of the straight ones recommended for simple urethral affections. The irrigations should be copious and repeated often, and balsamics should be given internally. In cases where tuberculosis is suspected, it is best to discontinue instrumental treatment, and the severe irrigations. Irrigate with boric acid and by mouth give hexamethylenamin (urotropin) or guaiacol. Treat the patient as you would treat any cases of pulmonary tuberculosis.

CHAPTER XV.

GONORRHEAL METASTASIS.

A number of diseased conditions in remote parts of the body result from the transmission of the gonococcus by the lymph and blood circulation. The conditions are similar to those produced in pyemia and septicemia. There may result an inflammation of a joint, of the heel, the iris, endocardium, meninges, muscles, tendons and their sheaths. These metastatic conditions may accompany chronic as well as acute gonorrhea. In most cases metastasis takes place during the second or third week of the disease.

Gonorrheal arthritis is the metastasis that occurs most often. It is characteristic of this affection that it usually recurs with every new attack of gonorrhea and with every exacerbation of the old attack. It begins as an acute or subacute inflammation of one or more joints. The monoarticular form usually attacks the knee-joint. If the condition lasts for some time, it becomes chronic, is accompanied by a serous exudation, when it is called a gonorrheal knee. The polyarticular form gradually affects all the joints of the body. This form of arthritis is characterized by periarticular swelling and not infrequently it is accompanied by fever.

Various joints are affected for varying periods of time. Any one joint may be attacked especially severely and

be involved for a long time after the disease has subsided in all the other joints. In cases that run an unfavorable course, secondary contraction takes place in the capsule of the joint by reason of the newly-formed connective tissue. The mobility of the joint is reduced and sometimes ankylosis takes place. This is followed by atrophy of the muscles and the patient is rendered more or less helpless.

Even in cases of long-standing, the prognosis is not absolutely bad, except when the case simulates an arthritis deformans.

Besides the appropriate treatment of the original affection, the gonorrhea, the local treatment to be recommended consists of the application of dry hot air, cataplasms and prolonged warm baths, and later on a well-conducted course of massage.

Bier's method of treatment by means of a passive hyperemia also yields good results, especially in acute cases. The latter is the method to which I give preference before all others. The most severe pains are often relieved within an hour after applying an elastic bandage, and we can at once begin with passive movements of the affected joint, and the splints can be left off, or only worn at night and in very severe cases. In order to secure good results by this method of treatment, the elastic bandage should be applied as high up as possible, and should be worn twenty to twenty-two hours out of the twenty-four. The constriction must be strong enough to produce edema.

Potassium iodide and sodium iodide, given in five

grain doses, three times a day, often produce beneficial results.

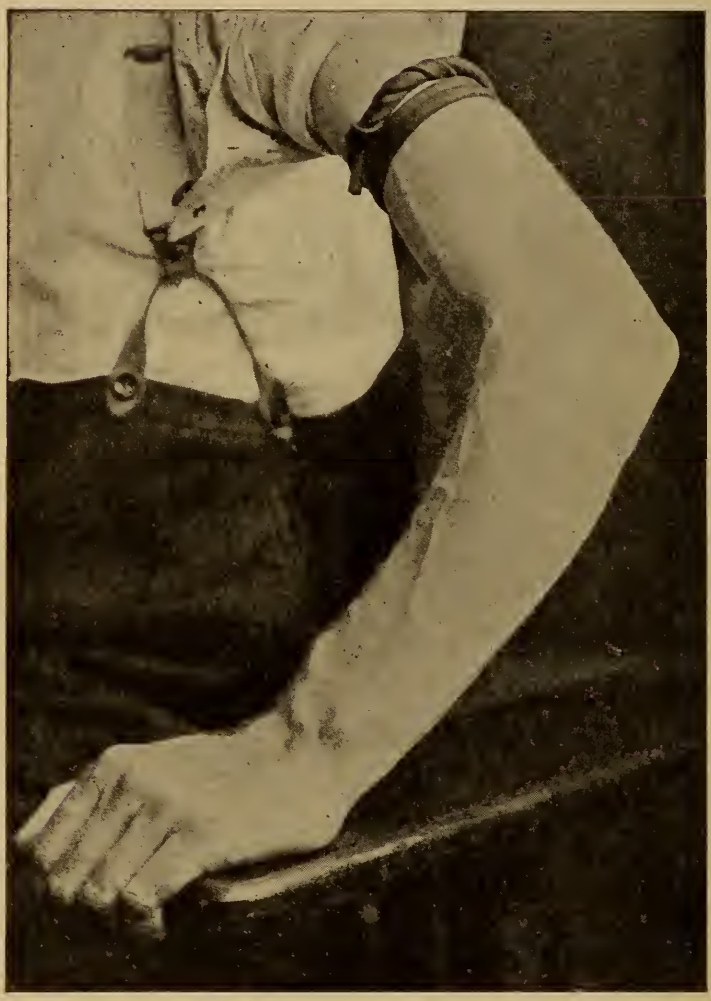

FIG. 52.—Shows an elastic bandage applied for gonorrheal arthritis of the wrist.

℞ Potassii iodidi, ... ℥ijss.
Elix. lacto pepsini, q. s., ad., ... ℥iv.
S ℥j t. i. d., p. c.

The following prescription has also given good service:

℞ Aspirin, ... ℥ii to iii.
Urotropin, ... ℥i to ii.
Aquæ, q. s., ad., ... ℥iv.
℥i, three to four times a day.

In cases in which rational medical and instrumental treatment cannot be given for the underlying infection, the gonorrhea, vaccination may benefit the patient, but the intoxication is seldom as specific as that derived from rational medical and instrumental treatment, and the results, therefore, are seldom as satisfactory.

CHAPTER XVI.

PERIURETHRAL INFLAMMATIONS.

Inflammation of the periurethral tissues, the spongious body of the urethra and the cavernous bodies of the penis, are of frequent occurrence in acute and in chronic gonorrhea. Cavernitis is due to the spreading of the gonorrheal or the mixed infection from the epithelial covering of the urethra through the mucosa and submucosa to the *corpus cavernosus urethræ*, and in some cases to one or both of the cavernous bodies. These foci of inflammation usually disappear under appropriate treatment, but suppuration may occur. According to M. v. Zeissl, this takes place most often into the coronary sulcus near the frenulum.

If the periurethral inflammation occurs during the course of an acute gonorrhea, very painful erections, called chordee, occur. Chordee is a curved erection of the penis with the concavity toward the focus of infiltration. If there is present a cavernitis urethræ, the direction of the concavity is downward, and if the cavernous bodies are involved, the direction is upward. The forced curvation of the penis and the infiltration of the cavernous bodies may cause a tearing of the erectile tissues, and a consequent severe hemorrhage.

If the foci of the acute infiltration are not com-

pletely absorbed, there remains an induration known as a chronic cavernitis, which may give rise to deformities of the penis. An etiologic relationship between such indurations and gonorrhea cannot alway be established. In some cases its discovery by the patient is coincident with the beginning of a secondary syphilis. The patient will often give as a cause interrupted coitus. In most cases the induration has reached the size of a pea or larger before it is discovered by the patient.

In the acute stage, the treatment should consist of absolute rest and the application of hot or cold and the use of mercurial salve. The treatment of the urethral gonorrhea is interrupted for the time-being. If fluctuation appears, the abscess should be opened and treated antiseptically.

If the induration is a chronic one, it may be reduced by the use of galvanic electricity. The strength of the current necessary is six to eight milliamperes. The positive pole (sponge electrode) is saturated with iodide of potassium iodine solution and applied to the affected parts. The negative pole is applied either to the opposite side of the penis or intraurethrally. Complete excision of the induration has also been recommended.

The occurrence of such a complication during the course of instrumental treatment requires immediate cessation of the dilatations, and the institution of mild irrigations. The spontaneous evacuation of little abscesses should be waited for patiently. After the acute stage of the complication has passed, a gradual return to the instrumental treatment is indicated,

inasmuch as the remains of the little abscesses are affected favorably by the graduated dilatations.

The periurethral abscesses appear particularly during a chronic gonorrhea in which there exists a strong tendency toward the formation of strictures. The treatment consists in evacuation and drainage. The instrumental treatment of the coexisting chronic gonorrhea must be discontinued for the time-being. The remains of abscesses and even fistulæ may be treated successfully by dilatation after the acute stage has passed.

FOLLICULAR AND PERIURETHRAL ABSCESSES.

The chronically inflamed follicles of the urethra appear as painless nodular swellings which are easily palpable when the urethra is distended with a hard instrument. The size of these nodules varies from that of a lentil to that of a pea. No special treatment of these swellings is indicated unless they become very large and painful, an incident which may occur independently of any treatment that may be given.

PARAURETHRAL DUCTS.

Formerly, these ducts were regarded as structures of minor importance, and only during the past few years have they come into any prominence at all in connection with the treatment of gonorrheal affections of the urethra. They are invaded easily by the gonococcus, but on account of their anatomic condition, it is difficult to treat them. These ducts, unless recognized

by the operator, may be the seat of most obstinate infections.

Treatment.—The ducts are split open as far back as possible and are treated by the application of compresses of acetate of aluminum or with moist or dry iodoform or aristol gauze, or iodoform collodion. In the case of ducts situated in the region of the prepuce, and that have a straight course, good results may be obtained from electrical acupuncture. The direction of the duct may be ascertained with a thin round wire, and the narrowest parts may be widened somewhat. The negative electric sound is then introduced to the end of the duct, the positive pole being applied to the opposite side of the penis. The strength of the current is measured by the sensations of the patient. It should be strong enough to cause a slight prickling pain. Bleeding should be avoided as much as possible.

The repair of the tissues after electrolytic intervention will require from fourteen days to three weeks. The treatment may have to be repeated a number of times before satisfactory results are obtained. The ducts may also be irrigated or injected with a 2 to 5 per cent. solution of silver nitrate. A blunt canula is used to make the injection.

CHAPTER XVII.

HEMORRHAGE.

Hemorrhages take place in the course of the treatment of gonorrheal affections, either spontaneously or as the result of therapeutic intervention. When the hemorrhage is in the anterior urethra bleeding will take place in drops, or the blood will coagulate around the meatus. If the hemorrhage is in the posterior urethra, the blood may drop from the meatus after urination, or if the bleeding is slight, the last drops of urine only are blood-stained or the blood may flow into the bladder in smaller or larger quantities to be mixed with the urine or to settle to the bottom, appearing as a sediment at the end of urination.

The hemorrhages from the sexual glands are by far the most common. The blood flows into the bladder and is voided with the urine. Hemorrhages in the seminal vesicles, spermatic cord, the epididymis, or the testes, are manifested by coffee-brown seminal emissions. Bleeding from the ejaculatory ducts produces an admixture of fresh blood with the seminal discharge. Bleeding of the mucosa of the bladder and hemorrhage from the upper urinary passages very seldom is caused by the gonorrhea. Such a hemorrhage must always excite suspicion of the presence of

other disease conditions, such as tuberculosis, tumors, or concretions.

It is not always easy to determine the seat of the hemorrhage. Even the most experienced operator may be in error, especially when the decision must rest between bleeding in the posterior urethra and bleeding in the bladder. Hemorrhages from the urethra may take place spontaneously, that is, they are caused by the disease alone, or they may be the consequence of trauma of the mucous membrane of the urethra incident to the treatment, such as the introduction of an instrument or the local use of caustic drugs. Spontaneous bleeding of the anterior urethra occurs much less often than from the posterior urethra. This is easily understood when we take into consideration the fact that the mucous membrane of the posterior urethra is of a more delicate structure than that of the anterior urethra, and that the underlying tissues in the posterior urethra are less elastic and therefore more exposed to insult than those of the anterior urethra.

Spontaneous bleeding of the anterior urethra occurs during the course of a chronic gonorrhea, especially after sexual intercourse, and is usually caused by epithelial granulations or by papillomata. A careful urethroscopic examination will always reveal the cause of and locate the bleeding. Oberlaender observed two cases where the bleeding occurred after coitus and was caused by infiltrations of the second degree that were located in the bulb. In one case the bleeding had lasted three weeks, and the patient had

become anemic. In the other case the bleeding had existed only eight days. In both cases the hemorrhage ceased after the first dilatation.

Bleeding from the posterior urethra usually shows itself as a so-calld terminal bleeding (Posner). It may last days or weeks, with or without intermission, and with the loss of varying amounts of blood. If the blood flows into the bladder and is voided with urine it may be mistaken for a case of hemorrhage from the bladder. A careful urethroscopic examination of the posterior urethra will usually locate the bleeding points, whereas cystoscopy is negative.

Papillomata are often found to be the cause of bleeding. Forced dilatation should be carefully avoided in such cases. If the terminal bleeding persists after micturition, and if there is no history of gonorrhea, and if the objective findings are negative of gonorrhea, the case should excite suspicion, and tuberculosis should be thought of. This doubt must be cleared up before instrumental treatment is proceeded with.

The treatment of hemorrhages consists of rest, ice compresses, and eventually the introduction of a permanent catheter.

CHAPTER XVIII.

THE VACCINATION THERAPY OF GONORRHEA.

The methods of treatment described in the previous chapters deal with the destruction of the infecting germ by local chemical and local hyperemic means. The vaccination therapy of gonorrhea tends to increase the resistance of the patient, and thus promote the destruction of the gonococcus by anti-bodies and essential phagocytosis.

The method consists in the subcutaneous injection of measured doses of killed gonococci, or in case of a non-specific or a mixed infection of the urethra, of the germs found in the discharged pus, to which the patient's serum shows a low opsonic index. The microorganisms to be used for vaccination are cultivated, their number approximately determined, and then sterilized at 60° Celsius. The quantity of vaccine to be used is determined by the effect which an injection has upon the opsonic index of the patient.

If a suitable dose has been given, there occurs a short negative phase—the anti-bodies and the opsonins are decreased in quantity, and this is followed by a rather prolonged positive phase, anti-bodies and opsonins are increased.

If too large doses are given, the negative phase is exaggerated and prolonged.

It has been noted that improvement and even recovery go hand in hand with the increase of the opsonic index. But the majority of these investigations have been made with more enthusiasm than truly scientific spirit and special knowledge, and the results of their experiments do not stand scientific criticism.

The opsonic index of the patient's serum is determined by Wright's method, but its technic is disagreeable to the patient, and only few—mostly old, obstinate, mixed infections can be induced to stand the ordeal of a course of treatment controlled by the opsonic test. Experiments which have been going on for some time at the Columbus Medical Laboratories show that the therapeutic results obtained by the vaccination therapy are a valuable addition to the medical and instrumental treatment.

But the vaccination therapy as well as the medical and the instrumental treatment are limited to the production of injuries, and as the injury intended for the disease-producing germ will equally affect its host, the therapeutic results, good or bad, will depend upon the resistance and recuperative power of the patient. In other words, we have only one curative agent, only one remedy, namely, *the patient.*

The human body is the product of the struggle for existence, a selected fighter, who has learned to convert received injuries into stimuli of his own defense. The specific injury, the specific intoxication, which is obtained from the indirect action of the medical and the instrumental treatment, and under favorable conditions

also from the vaccination, will, if adequately measured, stimulate the curative forces of the body to an increased effort at the defense.

I have at present under observation three cases of gonorrhea and gonorrheal arthritis, which have been greatly improved by local medical and instrumental treatment, while several courses of vaccine and serum treatment were without benefit to the patients.

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